



SDMS Doc ID 2003544

FINAL
QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION
ORDOT LANDFILL SITE
GUAM

0000067

R E M II

**PERFORMANCE OF REMEDIAL RESPONSE
ACTIVITIES AT UNCONTROLLED
HAZARDOUS WASTE SITES**

U.S. EPA CONTRACT NO. 68-01-6939

CAMP DRESSER & MCKEE INC.
PRIME CONTRACTOR

FINAL
QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION
ORDOT LANDFILL SITE
GUAM

0000067

Prepared by:

Camp Dresser & McKee Inc.
2302 Martin Street, Suite 275
Irvine, California 92715

Work Assignment No.: 168-9LA7.0
U.S. EPA Contract No.: 68-01-6939
Document No.: 279-WP1-OP-DFDH-1

September 25, 1986

FINAL
QUALITY ASSURANCE PROJECT PLAN
REMEDIAL INVESTIGATION

ORDOT LANDFILL SITE
GUAM

Work Assignment No.: 168-9LA7.0
U.S. EPA Contract No.: 68-01-6939
Document No.: 279-WP1-OP-DHZC-1

September 25, 1986

Approved by:  9-30-86
James A. Goodrich, CEG
Site Manager Date

Approved by: Sara R Black 10/6/86
Sara R. Black, Date
Region IX Technical Review Committee

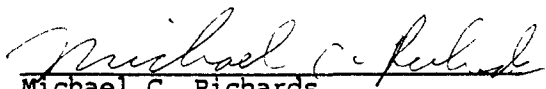
Approved by:  10/7/86
Michael C. Richards Date
REM II, Region IX Regional Manager

TABLE OF CONTENTS

<u>Section</u>	<u>Pages</u>	<u>Revision</u>	<u>Date</u>
A. Title Page	1	3	9/25/86
B. Table of Contents	5	4	9/25/86
1.0 INTRODUCTION/OVERVIEW	2	2	9/25/86
2.0 PROJECT DESCRIPTION	11	3	9/25/86
2.1 Site Description			
2.2 Site Investigation			
2.3 Community Concerns			
2.4 Project Goals			
2.5 Project Schedule			
3.0 PROJECT ORGANIZATION AND RESPONSIBILITY	6	2	9/25/86
3.1 Program Organization			
3.2 Project Organization			
3.3 Quality Assurance Organization			
4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA	3	2	7/24/86
5.0 SAMPLING PROCEDURES	6	5	9/25/86
5.1 Development of a Sampling Plan			
5.2 Types, Locations, and Number of Samples			
5.3 Specific Sampling Objectives			
5.3.1 Ground Water Program			
5.3.2 Surface Water Program			
5.3.3 Methane Program			
5.4 General Sampling Protocols			
6.0 FIELD MEASUREMENTS	3	1	3/13/86
6.1 Atmospheric Gas/Vapor Monitoring			
6.2 Geologic Reconnaissance			
6.3 Ground Water Measurements			
6.4 Water Quality Parameters			
7.0 SAMPLE AND DOCUMENT CUSTODY PROCEDURES	6	4	9/25/86
7.1 Sample Type Delineation and Handling			
7.2 Custody Procedures and Documentation			
7.2.1 Traffic Report Form			
7.2.2 Chain-of-Custody Form			
7.2.3 Custody Seals			

TABLE OF CONTENTS (cont.)

<u>Section</u>	<u>Pages</u>	<u>Revision</u>	<u>Date</u>
7.3 Field Notebooks			
7.4 Corrections to Documentation			
7.5 Sample Shipping			
8.0 EQUIPMENT CALIBRATION, MAINTENANCE, AND OPERATION	7	2	7/24/86
8.1 Inspection			
8.2 Written Operating Procedures			
8.3 Calibration			
8.4 Maintenance			
8.5 Master Equipment Control Record			
9.0 ANALYTICAL PROCEDURES	7	3	8/28/86
9.1 General Laboratory Requirements			
9.2 Data Requirements			
9.3 Laboratory Performance			
9.4 Analytical Data Review			
10.0 DATA REDUCTION, VALIDATION, AND REPORTING	8	3	8/28/86
10.1 Data Logging and Analysis			
10.2 Data Validation			
10.2.1 Analytical Data			
10.2.2 Field Measurement Data			
10.3 Final Reporting and Report Archival			
11.0 DATA MANAGEMENT AND DOCUMENT CONTROL	13	2	7/24/86
11.1 Introduction			
11.1.1 Purpose of Data Management			
11.1.2 Scope of Data Management Plan			
11.2 Data Management Personnel			
11.2.1 Data Management Organization			
11.2.2 REM II Site Manager			
11.2.3 Field Data Coordinator			
11.2.4 Project Librarian			
11.3 Document Control Procedures			
11.3.1 Introduction			
11.3.2 Document Types and Identifying Codes			
11.4 Field Data Management and Sample Control			
11.4.1 General Procedures			
11.4.2 Field Logbooks			
11.4.3 Sample Control			
11.5 Project Library Procedures			

TABLE OF CONTENTS (cont.)

<u>Section</u>	<u>Pages</u>	<u>Revision</u>	<u>Date</u>
11.5.1 General Library Procedures			
11.5.2 Filing Procedures and Confidential Files			
11.5.3 Confirmation that Documents are Filed in the Library			
11.5.4 EPA Enforcement and Classifications and Handling Procedures			
11.6 Computer Data Storage			
11.6.1 Use of Computer Data Bases			
11.6.2 Central Data Base			
11.6.3 Local Databases			
11.6.4 Data Backup			
11.7 Data Archiving			
12.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY	4	4	9/25/86
12.1 Quality Control Checks for Laboratory Activities			
12.2 Quality Control Procedures for Field Measurements			
12.2.1 Water Level Measurements			
12.2.2 Water Quality Parameters			
12.3 Quality Control Checks for Deliverables			
13.0 PERFORMANCE AND SYSTEM AUDITS	2	1	3/13/86
13.1 System Audits			
13.2 Performance Audits			
14.0 DATA MEASUREMENT ASSESSMENT PROCEDURES	5	2	7/24/86
14.1 Accuracy			
14.2 Precision			
14.3 Completeness			
14.4 Comparability			
15.0 CORRECTIVE ACTION	1	1	3/13/86
16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT	1	1	3/13/86
<u>REFERENCES</u>	1	1	3/13/86
<u>APPENDICES</u>			
APPENDIX A Glossary of Terms	2	1	3/13/86

LIST OF TABLES

Table

2-1	Organic and Inorganic Constituents Associated with Military Landfills
2-2	Preliminary List of Deliverable Items - Phase I
4-1	Quality Control Criteria Objectives
5-1	Site Investigation Protocol and Sampling Procedures
8-1	Equipment Maintenance Schedule
8-2	List of Critical Spare Parts
9-1	Close Support Laboratory Analytical Procedures
9-2	Air Sampling Methods Selection Matrix
14-1	Summary of Sample Data Collection
14-2	Air Quality Sampling and Analysis

LIST OF FIGURES

Figure

2-1	Site Location, Ordot Landfill Site
2-2	Site Location, Ordot Landfill Site
2-3	Sampling Location, Ordot Landfill Site
2-4	Schedule of Activities
3-1	Program Organization Chart
3-2	Project Organization Chart
3-3	Quality Assurance Organization Chart
10-1	Data Validation and Tracking System
11-1	Data Management Organization
13-1	Audit Flow Chart

DISTRIBUTION LIST

<u>TITLE</u>	<u>NAME</u>
REM II Quality Assurance Director	Robert C. Clinger, P.E.
REM II Deputy Quality Assurance Director	Ulric P. Gibson, Ph.D, P.E.

Section: B
Revision: 2
Date: 8/28/86
Page: 5 of 5

DISTRIBUTION LIST (Continued)

<u>TITLE</u>	<u>NAME</u>
REM II Region IX Quality Assurance Coordinator	Robert Harpster
REM II Region IX Regional Manager	Michael C. Richards
REM II Site Manager	James A. Goodrich
REM II On-Site Coordinator	Kevin Kelly
USEPA Region IX Regional Project Officer	Keith Takata
USEPA Region IX Remedial Project Manager	Thomas A. Mix
USEPA Region IX Quality Assurance Officer	Terry L. Stumph

1.0 INTRODUCTION/OVERVIEW

This Quality Assurance Project Plan (QAPP) is provided as a deliverable for the Ordot Landfill Site, Guam in accordance with EPA Work Assignment Number 168-9LA7.0 as part of REM II Contract Number 68-01-6939. The QAPP addresses the requirements set forth in 40 CFR 30, including procedures to ensure the precision, accuracy, completeness, and representativeness of water, air and field chemistry data collected and generated during the course of this Remedial Investigation. Further, the QAPP provides the quality assurance requirements for data handling and manipulation and is intended to guide field, laboratory, and management personnel in all aspects of data collection, management, and control while on or off site.

The QAPP addresses U.S. Environmental Protection Agency (EPA) policies and guidelines that REM II Team Members are implementing as part of the REM II quality assurance/quality control (QA/QC) program. Quality assurance is defined as the integrated program designed for assuring reliability of monitoring and measurement data. Quality control is defined as the routine application of procedures for obtaining prescribed standards of performance in the monitoring and measuring process. Adherence to a centrally managed QA/QC program is a requirement of the REM II Contract. Each REM II team member has the responsibility to implement adequate procedures which assure that the precision, accuracy, completeness, and representativeness of its data and data products are known and documented. Quality Assurance procedures such as tracking, reviewing and auditing are implemented as necessary to ensure that all project work is performed in accordance with professional standards, EPA and other governmental regulations and guidelines, and specific project goals and requirements stated in the site Work Plan.

Standard operating procedures (SOPs) from private, state, and federal sources have been reviewed, modified where necessary, and incorporated by reference into this QAPP. Sample collection, field measurements, and field testing will be performed in accordance with these standard operating procedures. Analytical samples will be analyzed by laboratories within the EPA Contract Laboratory Program.

Quality control of field data, tabulations, analyses, computations and interpretation of field data will be performed by technical project personnel. Quality control of project deliverables will be provided by peer and senior staff review. Equipment used to take field measurements will be maintained and calibrated, and records of these kept, in accordance with established procedures. Quality assurance of all project activities will be maintained by periodic audits scheduled by the Quality Assurance Director.

Document control procedures will be implemented to keep track of documents used in this study. These procedures will be used to coordinate distribution, coding, storing, retrieving, and reviewing of all data collected. These procedures will also protect sensitive materials related to EPA enforcement activities that might be generated or obtained during the course of this study. Document control is also monitored by periodic quality assurance audits.

This QAPP has also been prepared in accordance with the requirements of the REM II Quality Assurance Program Plan (Document No. 999-QC1-RT-ACAB-3) and the following guidelines established by the USEPA and the REM II quality assurance program management, respectively:

- o USEPA. February 1983. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, EPA-600/4 - 83-004.
- o CDM Team. June 1985. Generic Guidance for Quality Assurance Project Plans, Document No.: 999-QC1-QA-AVXN-3.

2.0 PROJECT DESCRIPTION

The Ordot Landfill has been used for disposal of military and domestic wastes with few records available of waste types actually disposed. Fish kills, strong odors, discolored runoff and seepage associated with the Ordot Landfill indicate that contaminants from materials disposed in the landfill may be seeping from the landfill and potentially threatening the island's single source aquifer supplying the island's drinking water supply. Existing data show elevated metals in the groundwater, but no data have been collected to date to demonstrate organics present or the source and constituents causing the air quality problem. The purpose of the Phase I studies described in this plan are to collect data on organic and inorganic constituents associated with water, soil and air samples from the site to better characterize the site.

A review of site investigations performed on other landfills indicate a number of common chemicals that are on the EPA's Hazardous Substance List. These compounds are listed in Table 2-1. CDM recommends that samples be analyzed for the complete suite of HSL pollutants. The air quality program will center on detecting the volatile compounds listed in Table 2-1.

The purpose of the Phase I portion of the Remedial Investigation (RI) at the Ordot Landfill site is to collect the data required to refine the scope of work for the Phase II portion of the Remedial Investigation. Because existing data are insufficient to precisely define the scope of work for the Phase II Investigation, this QAPP is limited to Phase I activities only. This QAPP will be amended to include the scope of the Phase II Investigation once the Phase I Investigation is completed. An Initial Site Characterization Report will be prepared after the data collected during the Phase I Investigation are evaluated. This Quality Assurance Project Plan has been designed to assure the quality of data gathered and generated as well as the conclusions and recommendations reached from use of the data. This document is intended as both a guide to quality assurance activities and as a companion document to the Sampling and Analysis Plan

TABLE 2-1

ORGANIC AND INORGANIC
CONSTITUENTS ASSOCIATED WITH MILITARY LANDFILLS

Chlorinated Organics*

1,1-Dichloroethane
Tetrachloroethylene
Trichloroethylene
Methylene Chloride
Chloroform
Trichloroethane
Carbon Tetrachloride
Chlorobenzene
Dichlorobenzene
Bromodichloromethane
Dibromochloromethane
Bromoform
1,2-Dichloroethylene
1,1-Dichloroethylene
Polychlorinated Biphenyls

Aromatic Hydrocarbons*

Benzene
Toluene
Xylene
Ethylbenzene

Ketones*

Acetone
Methyl Ethyl Ketone

Extractable Organics

Phenol
Benzanthracene
Benzo (a) pyrene
Chrysene
Naphthalene

Pesticides/Herbicides

DDT
Chlordane
Aldrin/Dieldrin
Heptachlor
2,4,5-T
2,4,5-TP

Metals

Arsenic
Chromium
Copper
Lead
Nickel
Cadmium
Zinc

* These compounds are sufficiently volatile as to be an air quality concern.

and Site Health and Safety Plan. All these documents govern field and data collection activities and should be used concurrently.

The Island of Guam is located in the western Pacific region, approximately half way between Japan and New Guinea, and is the largest island in the Mariana Island Group. Guam has an area of about 212 square miles, is approximately 30 miles long, and ranges between 4 and 11.5 miles wide (Figure 2-1). The island has two very distinct physiographic divisions. The southern half is composed of rugged volcanic upland and the northern half of the island is characterized by a limestone plateau. The majority of Guam's drinking water supply comes from groundwater produced from the sole-source limestone aquifer in the northern part of the island. The Ordot Landfill is located in the northern part of the volcanic upland area, near the divide between the limestone and volcanic provinces (Figure 2-2).

2.1 SITE DESCRIPTION

The Ordot Landfill has received the majority of the wastes generated on the island since before World War II. It has been operated more as a dump than as a municipal landfill. Only during the last ten years has cover material been placed over refuse, and even now waste cells are not uniform and cover material is minimal. The landfill is presently operated by the Guam Department of Public Works and receives municipal and military refuse.

The landfill is known to have received hazardous wastes during its history, which includes the Japanese occupation of Guam during World War II. The site is known to have received PCB contaminated oils from transformers, munitions, and hazardous wastes commonly used in households and light industry. However, records do not exist regarding when, how much, and what type of hazardous wastes were disposed of at the landfill.

The uncontrolled disposal of hazardous and other wastes at the Ordot Landfill has resulted in possible contamination of surface waters which flow unabated onto and from the site. The surface water, including a large spring (Figure 2-2) has resulted in leachate emanating from various

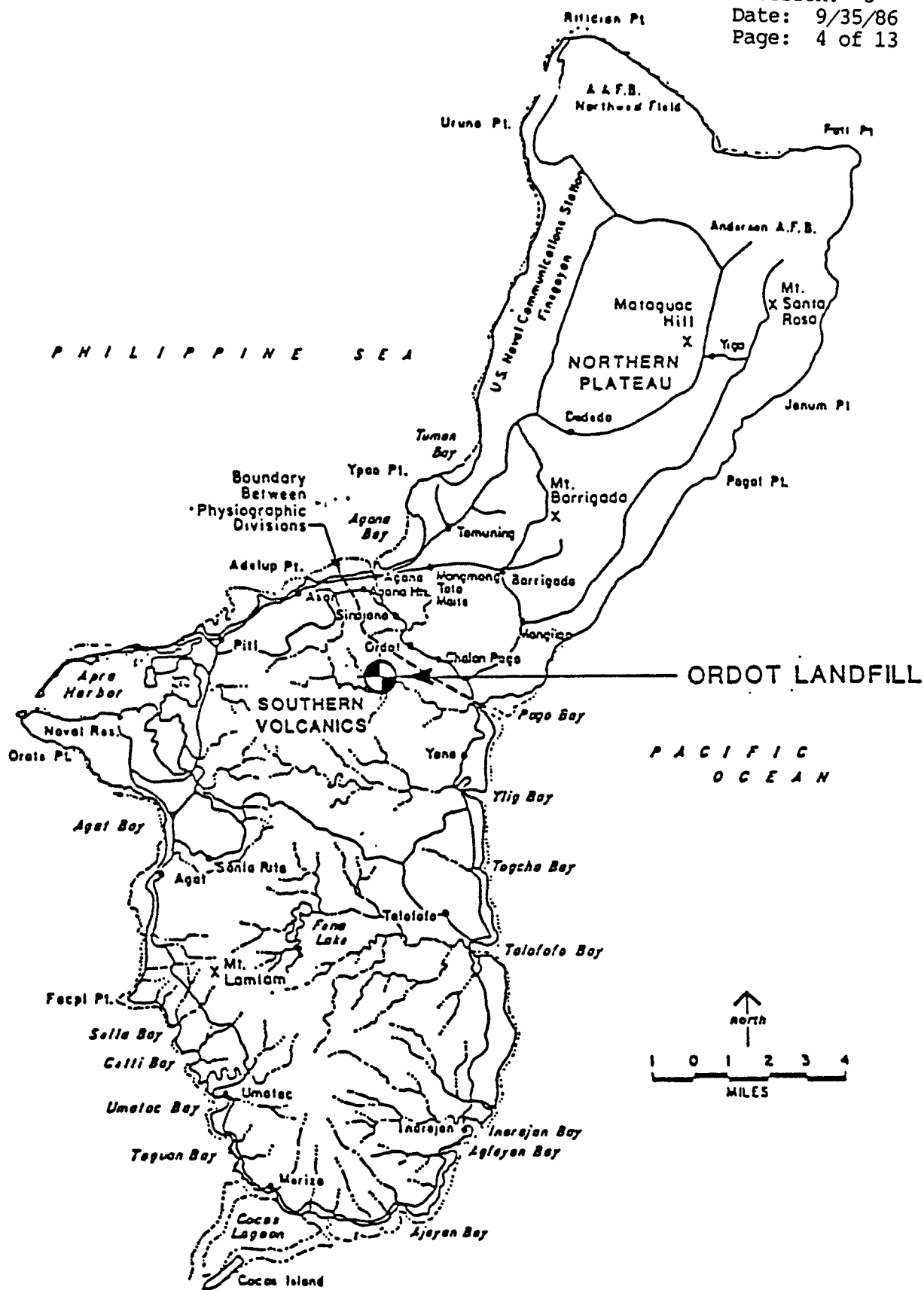


Figure 2-1
LOCATION OF ORDOT LANDFILL
ISLAND OF GUAM

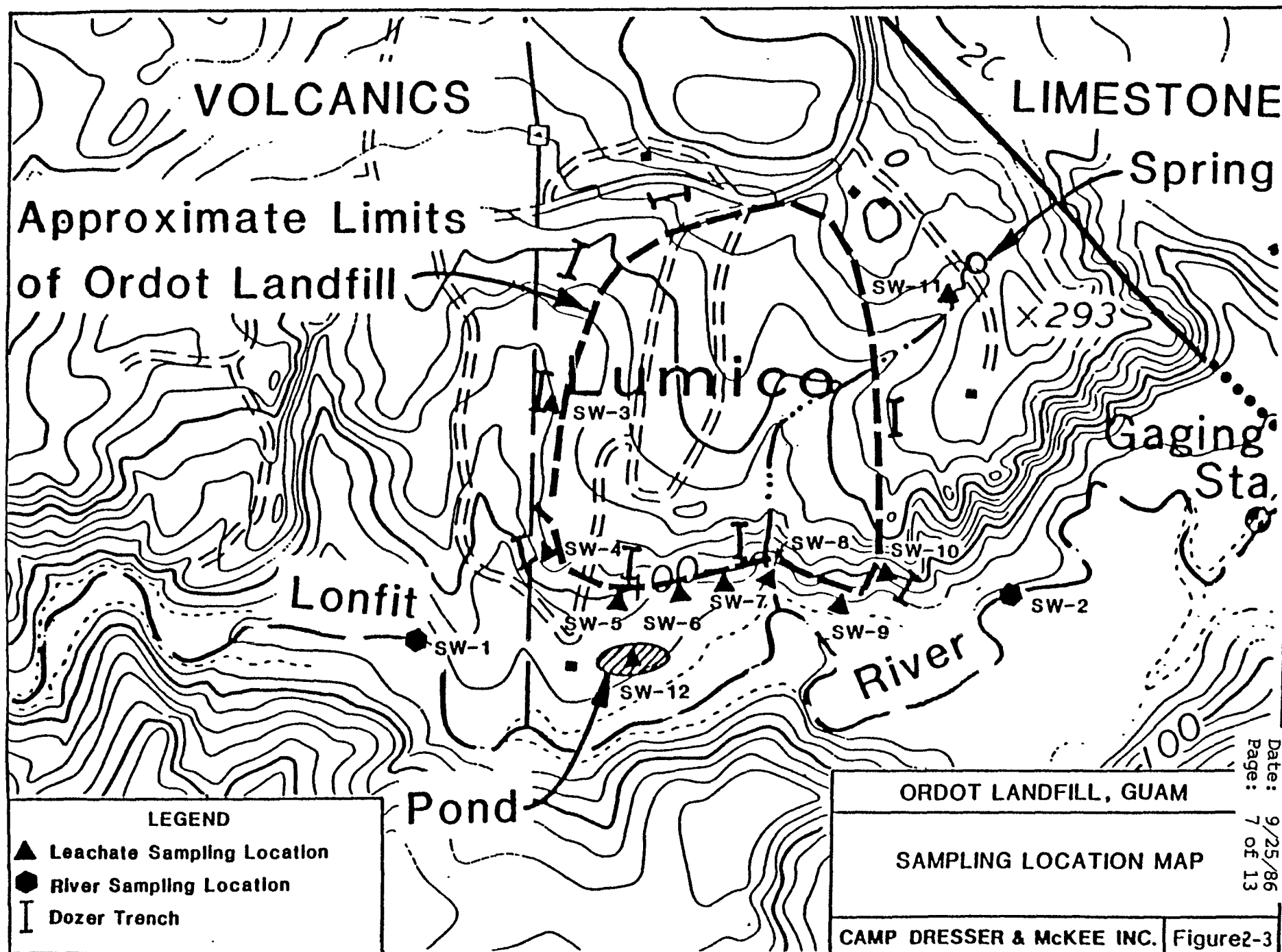
locations around the landfill. This leachate leaves the landfill site either in surface runoff or from small springs. The runoff eventually enters a stagnant pond or the Lonfit River (Figures 2-2 and 2-3). The leachate that discharges to the river eventually enters Pago Bay on the east side of the island. Fish kills have been reported in Pago River, downstream of the site. Contamination of marine life and recreational areas in Pago Bay may be sources of potential public health problems and, therefore, it is proposed that leachate and surface water sampling be conducted in the Site area.

An additional possible public health problem due to the Ordot Landfill is the potential contamination of the sole-source aquifer in the area. As previously described, the Ordot Landfill is thought to be located in the southern physiographic province where volcanic bedrock exists. However, the landfill is located very close to the limestone unit and, consequently, there is some concern that there is a potential for contaminating the limestone aquifer. There is also some concern that the landfill directly overlies the limestone aquifer. Contamination of the aquifer would result in a serious public health problem as it is the primary drinking water source for the island. Due to these circumstances, limited geologic reconnaissance and groundwater sampling efforts are proposed for the area.

2.2 SITE INVESTIGATION HISTORY

Since 1979, the Guam Environmental Protection Agency (GEPA) has conducted periodic sampling and analyses of four surface water monitoring stations on the Lonfit and Pago Rivers and three leachate monitoring stations at the landfill. Samples were analyzed for selected heavy metals and pesticides. With a few exceptions, most constituent concentrations are below action levels.

In addition to the ongoing GEPA monitoring of surface water and leachate, three studies have been conducted at Ordot Landfill. The first was commissioned by GEPA for the Guam Department of Public Works (GDPW) and was conducted by GMP Associates in 1981. The study was a master plan for the



Section: 2.0
Revision: 3
Date: 9/25/86
Page: 7 of 13

landfill and recommended changes in both the way the landfill is managed and the way the landfill is operated. It also recommended alternative ways that the site could be expanded and eventually closed. Very few of the management and operational recommendations made by GMP Associates were ever implemented by GDPW, primarily because of budget constraints.

The second study was conducted by Black and Veatch Engineers for the U.S. EPA in 1983. This study was done under Superfund contract number 68-03-1614 (Work Assignment No. Z-3-12). It was a reconnaissance-level study done as part of a larger study of potential hazardous waste sites in the Trust Territories. The project team spent one day sampling several leachate, groundwater, and surface water sites in and near the site area. Samples were analyzed for Priority Pollutants at various labs in the continental United States. The results of the analyses were not published in their report, however, they stated that "... low levels of contamination are contributed by the Ordot Landfill" and that nickel concentrations above action levels were noted at nearby Water Well No. A-11 (which is located in the main limestone aquifer north of Ordot Landfill). However, they recommended that no remedial action be taken at Ordot Landfill, even though the source of contamination was not identified for the well and the potential for future contamination of surface water and/or groundwater by unknown wastes buried in the landfill was not addressed.

The third study, which is currently underway at Ordot Landfill, is being conducted by the Water and Energy Research Institute (WERI) under a U.S. Geological Survey (USGS) contract. WERI is affiliated with the University of Guam. The WERI is attempting to install groundwater monitoring wells at the toe of the landfill in order to sample groundwater for organic contamination. Samples have not been collected at the time of this writing. Their method of drilling by hand auger and jetting (using leachate accumulating in the nearby pond) will probably yield sampling wells which will not be satisfactory for the work to be conducted during the RI.

2.3 COMMUNITY CONCERNS

There are no organized citizen's groups identified at this time. Contamination of marine life and recreational areas in Pago River and in Pago Bay are potential public health problems. The main area of concern stated by Guam health officials is the potential contamination of the sole-source aquifer in the area, resulting in a contaminated community water-source basin.

2.4 PROJECT GOALS

As indicated above, several potential health problems exist due to poor surface runoff control present at the Ordot Landfill. These poor controls could potentially result in the contamination of both groundwater and surface water supplies in the area. In order to better understand the potential for contamination, a Phase I Investigation has been proposed for the area as part of the RI. The Phase I Investigation will result in the collection of (1) leachate samples, (2) surface water samples, (3) air quality samples, and (4) a groundwater sample. This information will be utilized to develop an Initial Site Characterization Report for the site. Furthermore, the development of a data base which characterizes the leachate, surface water, and groundwater quality will be important for additional efforts to be conducted under the Phase II Investigation.

To evaluate the presence and extent of contamination at the Ordot Landfill site, the Phase I Investigation will be conducted. The primary objective of this Investigation will be to identify and define the problems and to refine a scope of work for the Phase II Investigation. The rationale for field sampling will be to identify contaminants, concentrations, and physical state of chemicals present so that an assessment of the problem can be made. The data collected will be used to determine the level of protection required during the Phase II Investigation and to estimate sources of contaminants, potential pathways, and exposure to surrounding population. The specific activities to be performed as a part of the Phase I Investigation are listed below.

- o Prepare project plans for Phase I Investigation
- o Conduct Phase I Investigation
 - Determine quality of leachate leaving the boundaries of the landfill.
 - Determine the water quality of the Lonfit river, upstream and downstream of the landfill.
 - Determine the water quality of the groundwater in the limestone aquifer in the vicinity of the Town of Ordot.
 - Perform a reconnaissance-level geologic investigation in the vicinity of the landfill in order to determine the bedrock unit underlying the landfill.
 - Perform a reconnaissance-level air quality survey to portray field conditions and collect air quality data.
- o Prepare Initial Site Characterization Report
- o Refine scope of Work and Project Plans for the Phase II Investigation

All data and documents collected during the course of the Phase I Investigation will be controlled as defined in the Data Management Plan. The plan will ensure proper chain of custody, maintenance of project library, development of a computerized data based and control of archived materials. This plan is described in Section 11.0.

2.5 PROJECT SCHEDULE

The schedule for completing the Ordot Landfill Phase I Investigation is presented on Figure 2-4 (Project Schedule). This investigation will take approximately five months to complete. Figure 2-4 also indicates the approximate times when Technical Review Committee meetings and QA/QC audits will be conducted. A Schedule of Deliverables which indicates when major deliverables will be reviewed internally and by whom, and when they will be submitted to the EPA for review and final approval will be prepared once funding for the RI has been received.

A systems audit will be performed near the completion of each major phase of the project by the Region IX Quality Assurance Coordinator. The scope of Phase II Investigation is not refined to the point that an audit schedule can be developed for that portion of the work. Under the REM II program, a performance audit is conducted for 10 percent of REM II sites. It is not known at this time whether a performance audit will be performed on the Ordot site Remedial Investigation activities.

A preliminary list of deliverable items is included as Table 2-2. Required reviews and/or approvals are noted (in accordance with Technical Operations Manual requirements).

FIGURE 2-4
REM II
SCHEDULE OF ACTIVITIES
ORDOT LANDFILL, GUAM

Site Number: 279

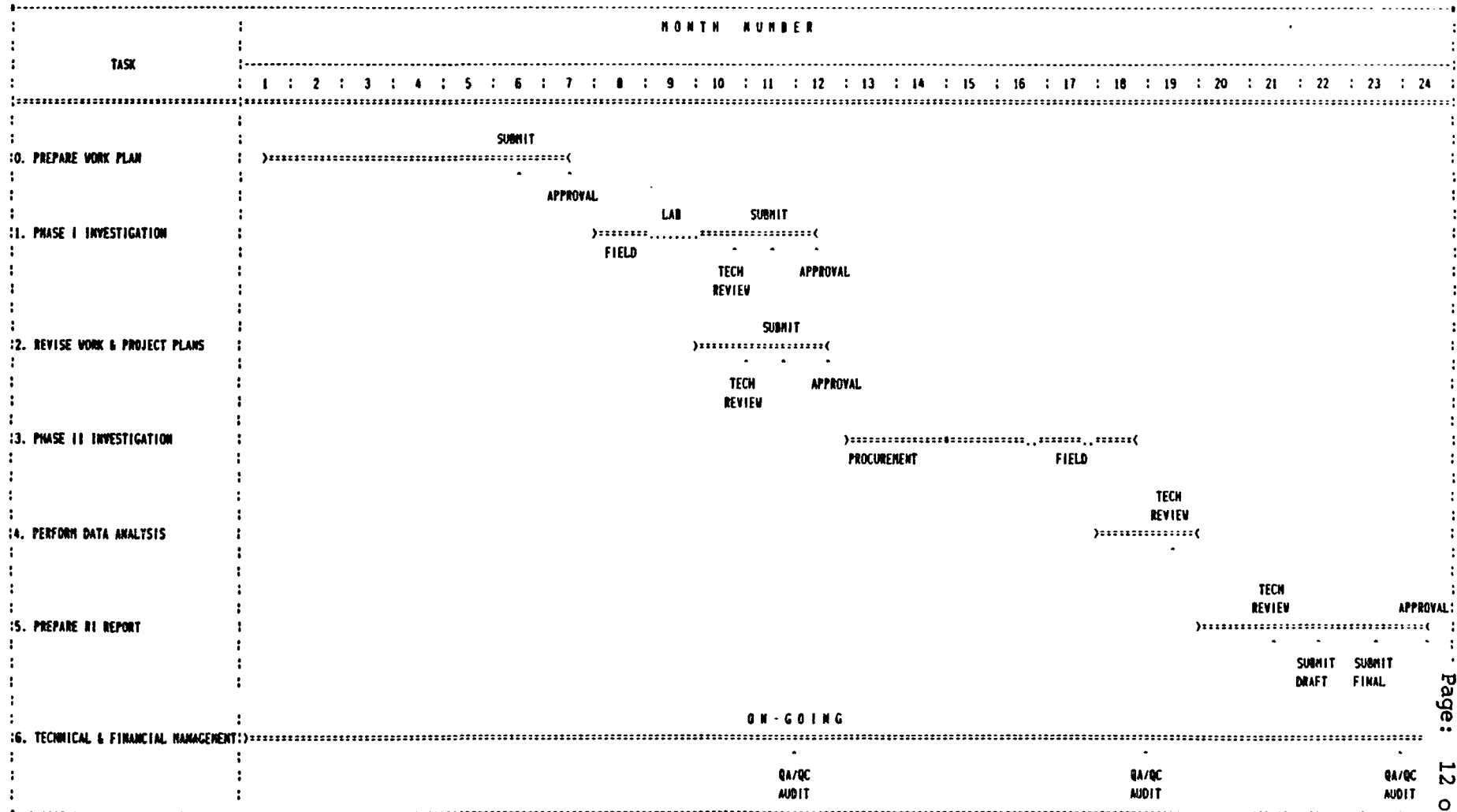
Site Name: ORDOT LANDFILL, GUAM

WA Code: 160.9LA7.0

Site Manager: J. GOODRICH

Date: DECEMBER 31, 1985

Phase: REMEDIAL INVESTIGATION: Phase I & II



REVISED: MARCH 6, 1986

Section: 2.0
Revision: 3
Date: 9/25/86
Page: 12 of 13

Table 2-2

PRELIMINARY LIST OF DELIVERABLE ITEMS

Phase I

Document	Review/Approval
Phase I Work Plan	RM, SM, TOM, FAM, RPO, RSPO, CO
Phase I Quality Assurance Project Plan	QAC, QAC, RM, RPO, QAO
Project Plans:	SM, RM, TOM, HSM
Sampling Plan	
Health and Safety Plan	
Data Management Plan	
Initial Site Characterization Memo	SM, RM, RPO, RSPO

Phase II Work Plan	(Same as Phase I)
Phase II QAPP	(Same as Phase I)
Phase II Project Plans	(Same as Phase I)
Remedial Investigations Draft Reports	SM, RM, TOM, RPO, RSPO
Remedial Investigations Final Report	SM, RM, TOM, RPO, RSPO, TS

* In accordance with the Technical Operations Manual (April 1985)

Legend:

RM	Region Manager
SM	Site Manager
TOM	Technical Operations Manager
FAM	Finance and Administration Manager
RPO	Regional Project Officer - EPA
RSPO	Remedial Site Project Officer - EPA
QAC	Region Quality Assurance Coordinator
QAD	Quality Assurance Director
QAO	Quality Assurance Officer - EPA
HSM	Health and Safety Manager
TS	Technical Specialist

3.0 PROJECT ORGANIZATION AND RESPONSIBILITY

3.1 PROGRAM ORGANIZATION

The REM II program and quality assurance organization and responsibilities are discussed in detail in Section A of the REM II Quality Assurance Program Plan. The program organization chart is reproduced as Figure 3-1. It shows quality assurance organized independently of technical operations, which is responsible for quality control.

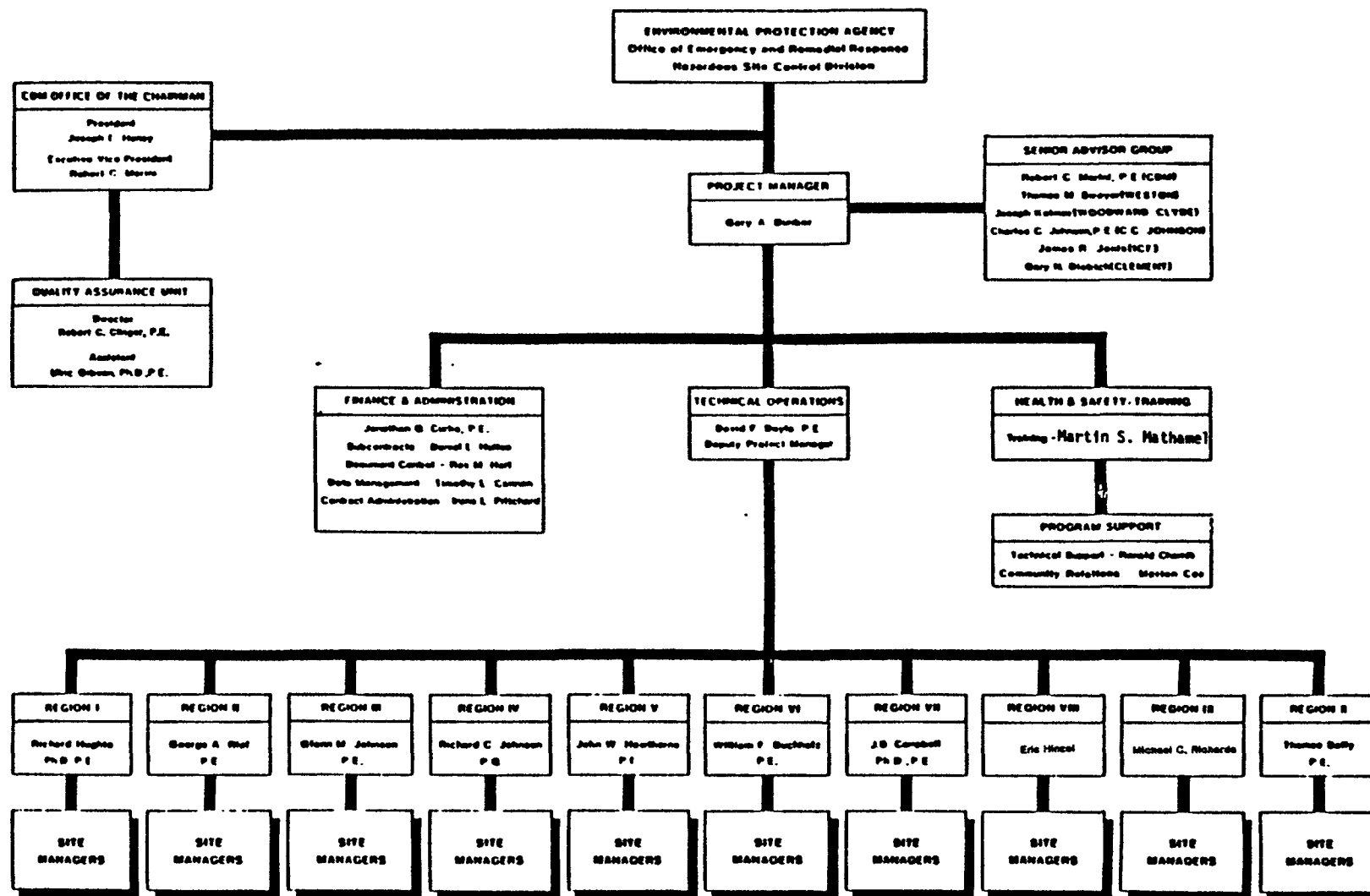
3.2 PROJECT ORGANIZATION

The project organization is presented as Figure 3-2.

Primary responsibility for all quality control activities relating to the Ordot Landfill is undertaken by the Site Manager who is answerable to the Technical Operations Manager through the Regional Manager. The Regional IX Manager, Michael C. Richards, will be responsible for the Ordot Landfill study. The Site Manager for the Ordot Landfill is James A. Goodrich and the On-site Coordinator is Kevin Kelly.

The Site Manager, James A. Goodrich, will be responsible for directing all day-to-day activities relating to the Ordot Landfill Remedial Investigation. In addition to site management activities, it will be his responsibility to ensure that quality control checks are performed for all field activities, data analyses, and deliverables and that technical reviews are performed as scheduled.

The On-Site Coordinator, Kevin Kelly, will also serve in a quality control capacity, bearing the responsibility for the quality of field data. It will also be the responsibility of the On-Site Coordinator to ensure that the Sampling and Analysis Plan is implemented, as approved by EPA and REM II personnel.



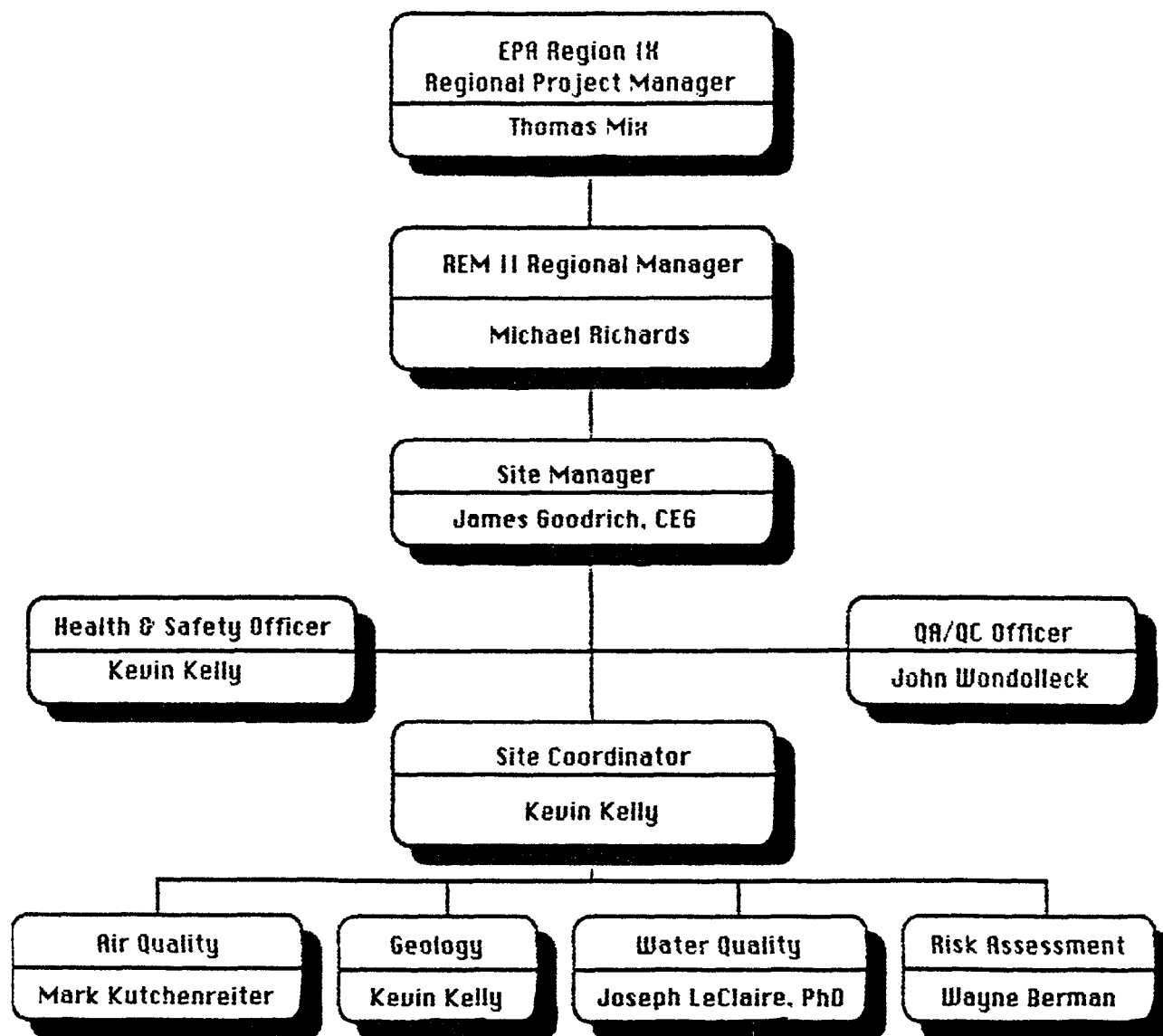
Section: 3.0
Revision: 2
Date: 9/25/86
Page: 2 of 6

Figure 3-1 Program Organizational Chart

FIGURE 3-2

PROJECT ORGANIZATION CHART

ORDOT LAND FILL, GUAM
PHASE I INVESTIGATION



3.3 QUALITY ASSURANCE ORGANIZATION

The REM II quality assurance organizational chart is presented in Figure 3-3. The Quality Assurance Director (Robert C. Clinger) and his Deputy (Ulric P. Gibson) answer directly to CDM corporate management for the quality assurance of all REM II projects. The Quality Assurance Director (QAD) exercises his responsibilities at the regional level through the Regional Quality Assurance Coordinators (QAC). The QAC for Region IX in which the Ordot Landfill Site is located is Robert Harpster.

Responsibilities of the QAD and QAC are discussed in detail in Sections A.5.3 and A.5.5, respectively of the REM II Quality Assurance Program Plan. Summaries of these responsibilities are presented below.

Quality Assurance Director

The Quality Assurance Director is responsible for all aspects of the Quality Assurance Program Plan. Responsibilities include approval of quality assurance procedures, conducting system and performance audits, and seeing that quality assurance personnel are trained. The Deputy Quality Assurance Director will assist him in the execution of his duties.

The Quality Assurance Director's specific responsibilities include:

- 1) Planning, implementing, and administering the quality assurance program;
- 2) Interfacing with EPA on quality assurance matters;
- 3) Reviewing procedures at least once a year with EPA to ensure consistency with quality assurance objectives and continued conformance with applicable regulations;
- 4) Auditing the overall performance of the quality assurance program, and developing a plan for regularly monitoring the quality aspects of hazardous waste management activities. The plan shall cover a major cross section of hazardous waste activities to ensure program control of documents and implementation of procedures. Auditors will be provided as needed;
- 5) Preparing a monthly report on the status of the quality assurance program for Chairman and the National Project Manager (see Figure

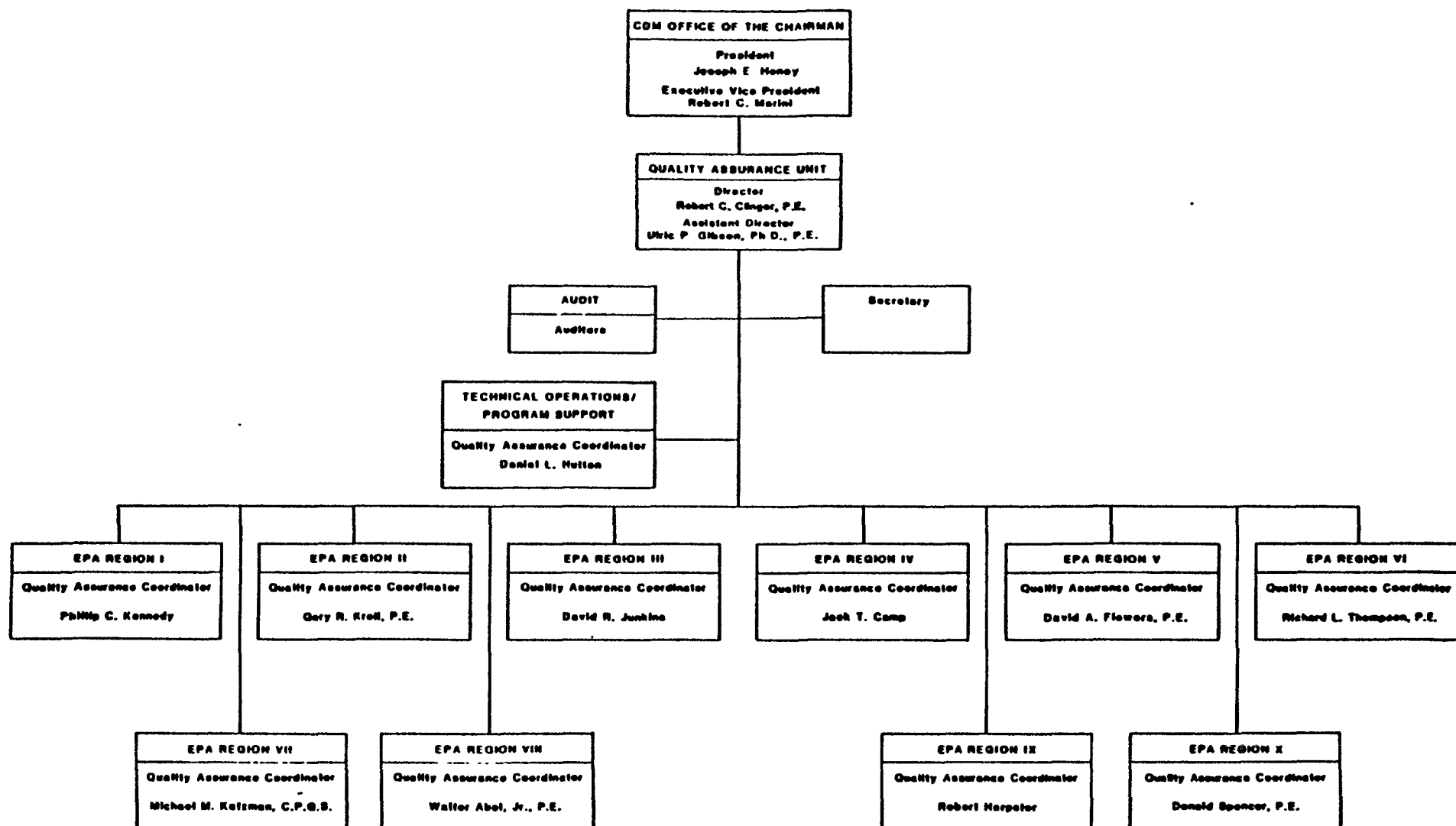


Figure 3-3 Quality Assurance Organizational Chart

3-3). This report will include summaries of audit findings and corrective actions, and progress in implementing the quality assurance program;

- 6) Working with all levels of personnel to identify and eliminate potential quality assurance problems;
- 7) Supporting corporate quality assurance audits of hazardous waste management activities.

Regional Quality Assurance Coordinator

The Regional Quality Assurance Coordinators are responsible for all procedures and tasks pertaining to quality assurance in their respective regions and report to the Quality Assurance Director (and his Deputy) for quality assurance activities.

Specific duties include:

- 1) Monitoring project activity to verify compliance with quality assurance plans;
- 2) Reviewing appropriate sections of Work Plan documents for approval;
- 3) Reporting periodically to the Quality Assurance Director on quality assurance activities;
- 4) Providing quality assurance for all technical deliverables produced in the region. Quality assurance will be achieved through routine audits of regional work assignments.

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

Quality assurance objectives for measurement data are usually expressed in terms of accuracy, precision, completeness, representativeness and comparability. Definitions of these characteristics are as follows:

- o Data Quality: The totality of features and characteristics of data that bear on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability.
- o Accuracy: The degree of agreement of a measurement (or an average of measurements of the same thing), X , with an accepted reference or true value, T . This is usually expressed as the difference between the two values, $X-T$, or the difference as a percentage of the reference or true value, $100 (X-T)/T$, and sometimes expressed as a ratio, X/T . Accuracy is a measure of the bias in a system.
- o Precision: A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is best expressed in terms of the standard deviation. Various measures of precision exist depending upon the "prescribed similar conditions."
- o Completeness: A measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.
- o Representativeness: The degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.
- o Comparability: The confidence with which one data set can be compared to another.

Initial site sampling will be exploratory in nature. The sampling will be conducted to identify the nature of contamination at the landfill so that a more extensive remedial investigation can be planned. The Quality Assurance objectives of the Phase I Investigation of the RI are presented in Table 4-1. The objectives for the analytical laboratory are presented in the CLP contract with the EPA.

This Quality Assurance Project Plan has been designed to implement the procedures necessary to maintain a consistent quality of technical

TABLE 4-1

QUALITY CONTROL CRITERIA OBJECTIVES^a

Sample Matrix	Parameters	Detection Limit	Precision Goals (RPD of Blind Duplicates)	Accuracy Goals (Matrix Spike Percent Recovery)	Completeness	Comparability
Water	RAS Volatiles Organics	A	+ 20%	75-125	85%	ug/l
	RAS Extractables	A	+ 20%	75-125	85%	ug/l
	RAS Pesticides	A	+ 20%	75-125	85%	ug/l
	Dissolved Metals	B	+ 20%	75-125	90%	ug/l
	Total Metals	B	+ 20%	75-125	90%	ug/l
	Cyanide	B	+ 20%	75-125	85%	ug/l
Air	SAS Volatile Organics	10 ug/m ³	+25%	70-115%	85%	ug/m ³

^a Quality Control Criteria for internal laboratory quality control checks is as specified in the CLP IFB for organics (WA8J-J680) and inorganics (WA85-J838).

A Detection limits, specified in the CLP IFB for organics (WA85-J680).

B Detection limits, specified in the CLP IFB for inorganics (WA85-J838).

Section: 4.0
Revision: 2
Date: 7/24/86
Page: 3 of 3

products. This consistency will be accomplished through the formal standardization and documentation of field techniques and through additional activities described in the remaining sections of this document.

5.0 SAMPLING PROCEDURES

General programmatic sampling requirements are provided in Sections E and L of the REM II Quality Assurance Program Plan. Section E requires that sampling and other activities which affect data quality must be conducted in accordance with formally documented procedures. It refers to the Standard Operating Procedures (SOPs) established in the Site Investigation Procedures Manual (SIPM) and specifies that all other procedures must be approved by the Technical Operations Manager prior to their use. Section L pertains to the handling, storage, and shipping of samples in accordance with procedures established in the Technical Operations Manual and the SIPM.

This section presents an overview of the sampling program to be conducted at the Ordot Landfill site during the Phase I Investigation and describes routine procedures to be followed by all site personnel performing field measurements, testing, and collection of samples. The specific SOPs, including REM II Site Investigation Procedures Manual (SIPM) document control numbers, to be implemented at the site are presented in Table 5-1. Any procedures developed specifically for this project will take precedence over the procedures provided in the SIPM.

Several field activities will be conducted during the Phase I Investigations. Surface water, groundwater, leachate, and air quality samples will be taken in and around the site to determine the general quality and quantity of leachate generated at the site. Trenching and mapping will be done in and around the site to determine the presence and nature of limestone adjacent to the site. Air samples will be collected to estimate the quantity and quality of gas produced at the site. The procedures presented in this section and Section 7.0 are designed to ensure that all samples collected are consistent with project objectives. This means that: (a) samples are identified, preserved, and transported in a manner such that data are representative of the actual site conditions, (b) information is not lost in sample transferral, and (c) data from the CLP program can be

TABLE 5-1
SITE INVESTIGATION PROTOCOL AND SAMPLING PROCEDURES

General Sampling Procedures	Method Number
Procedure for Use and Maintenance of Field Notebooks	5621004
Sample Classification, Handling and Shipment	5622001
Sample Identification procedure	5622002
Sample Bottle Preparation, Sample Preservation, and Maximum Hold Times	5622006
<hr/>	
General Quality Assurance Procedures	Method Number
Samples Collected for Quality Control Purposes	5622007
Chain-of-Custody	5622005
Procedure for Use and Maintenance of Field Notebooks	5621004
Calibration and Maintenance Procedure for Yellow Springs Instrument (YSI) Model 33 S-C-T Meter	6617002
Calibration and Maintenance Procedure for HaakeBuchler pH Stick	6617003

TABLE 5-1

SITE INVESTIGATION PROTOCOL AND SAMPLING PROCEDURES (cont.)

Activity	Procedure	Method Number
Field Water Quality	Operation procedure YSI Model 33 S-C-T Meter (Salinity, Conductivity, Temperature)	5617002
	Operation Procedure for HaakeBuchler pH Stick	5617003
	Procedure for Determining Temperature of Groundwater	5617004
Groundwater Sample Collection	Procedures for Water Level Measurement	5619007
	Procedure for Well Evacuation	5619008
	Considerations for Sample Withdrawal from Wells	5619009
	Procedure for Filtration of Samples	5617007
Air Monitoring	Operation Procedure for HNU Model PI 101 Photoionization Analyzer	5607001
	Operation Procedure for Gastechtor Hydrocarbon Survey, Model 1314	5607004
	Operation Procedure Centruy Portable Organic Vapor Analyzer (OVA) Model 128	5607003
	Procedure for Operation of the GCA MINIRAM Particulate/Aerosol Monitor Model PDM-3	5607021

used for enforcement purposes. These data will ultimately be used to determine the extent and nature of contamination and to support the feasibility study.

5.1 DEVELOPMENT OF A SAMPLING PLAN

The SAP follows guidelines and requirements as established by EPA Region IX. The SAP includes and/or describes the following:

- o Objectives of the sampling effort
- o Sample locations and selection criteria
- o Required field instruments and sampling equipment, including containers used and methods of sample preservation
- o Site-specific sampling methodology
- o Site-specific testing methodology
- o Decontamination procedures
- o Number of samples to be taken and sample numbering system
- o Types of field measurements required
- o Data requirements and analytical procedures to be used
- o Storage and shipping methods
- o Chain-of-custody procedures

5.2 TYPES, LOCATIONS, AND NUMBER OF SAMPLES

The types, locations, and number of samples to be collected are determined based on available background data and are specified in the Sampling and Analysis Plan. Surface water, groundwater, leachate and air samples will be collected during the Phase I Investigation. Chemical analyses to be performed include volatile and semi-volatile organics, pesticides, metals,

and cyanide. The analytical procedures to be performed by the EPA contract laboratories are outlined in Section 9.0 of this QAPP.

The location of each sample, with the exception of the air stations, is clearly defined in the Sampling and Analysis Plan on-site maps. Specific air sampling stations cannot be identified until investigators enter the field. Selection of sampling point locations will be made in accordance with prevailing wind directions during the time of the field investigation. Air samples will be collected at one upwind and two downwind points in the landfill area. Whenever possible, sampling locations will be documented by photographs. The sample location and type of sample will be indicated on a site sketch and in a field notebook.

5.3 SPECIFIC SAMPLING OBJECTIVES

5.3.1 GROUND WATER PROGRAM

- o Collect water sample and determine water level from the monitor well at Washington Jr. High School (Well No. A-11).
- o Analyze for RAS volatiles, semi-volatiles, pesticides, and metals.

5.3.2 SURFACE WATER/LEACHATE PROGRAM

- o Field-verify drainage patterns and structures in the study area.
- o Collect and analyze 12 water samples from various locations around the landfill.
- o Analyze for RAS volatiles, semi-volatiles, pesticides, and metals.

In addition to detailing the field methods involved in completing the above tasks, the SAP describes in detail all sample collection, preservation, and handling techniques.

5.3.3 AIR QUALITY PROGRAM

- o Analyze by direct reading instruments and sorbent tubes 195 samples to be analyzed for odors, particulates, and organic vapors. (SAS Organics)

5.4 GENERAL SAMPLING PROTOCOLS

Prior to undertaking sampling or drilling operations, CDM will establish a materials storage area at the site.

Portable decontamination equipment necessary to perform operations will be provided as described in the SAP and Site Health and Safety Plan (SHSP). CDM will also have sufficient safety equipment of adequate quality and level (Levels C and D) to protect personnel during site activities. Safety procedures to be used in the field investigations are described in the SHSP prepared by CDM.

All containers for water samples which are to be sent to through the Contract Laboratory Program will be provided by EPA through the Superfund Sample Bottle Repository. Sorbent tubes used for air quality analysis will be obtained from the laboratory performing the analyses.

6.0 FIELD MEASUREMENTS

Measurements of water and air parameters will be made in the field during the course of the Phase I Investigation. This section presents the routine procedures that will be implemented to conduct field measurements. Specific procedures to be followed, including the REM II Site Investigation Procedure Manual document control numbers, are listed in Table 5-1 and are presented in the Sampling and Analysis Plan.

The methods presented in this section and in the SAP are intended to ensure that field measurements are conducted in a similar and consistent manner by all individuals involved. By using standard procedures and protocols, the data collected by the sampling teams will carry out the objectives of the Work Plan.

6.1 ATMOSPHERIC GAS/VAPOR/PARTICULATE MONITORING

The presence and relative concentrations of organic vapors and gases, including methane, and of particulate matter in the atmosphere in the breathing zones will be measured with HNu and OVA instruments, a respirable dust monitor, and an explosivity monitor. These instruments will be used primarily to select appropriate levels of protection as described in the Site Health and Safety Plan. They will also be used as part of the overall site screening process and to detect any organic vapors in the well sample.

6.2 GEOLOGIC RECONNAISSANCE

One of the objectives of the Phase I Investigation is to determine the composition of the bedrock material in the area directly surrounding the landfill. To achieve this objective, a bulldozer will be used to clear the vegetation and excavate trenches for evaluation of the bedrock surface. The locations of the trenches are provided in Figure 3 of the Sampling Plan. The evaluation will take place in the field and noted in the site logbook. Following the evaluation, the excavated area will be filled and leveled, but not revegetated.

Once a trench has been excavated, the soil material overlying the bedrock will be visually described and entered into the field logbook. It is anticipated that a weathered soil horizon will exist to a depth of approximately 3 to 4 feet. The detailed description of the soil material will include the following information:

- o Stratification
- o Color utilizing Munsell Color notation
- o Texture using USDA or Unified Soil Classification System
- o Density or consistency
- o Odor
- o Relative moisture content
- o Relative porosity and permeability

6.3 GROUND WATER MEASUREMENTS

The procedures used for obtaining water level measurements will vary according to the type of well being measured. The detailed procedure for water level measurement at the Washington Jr. High School well is included in Section 6.4 of the SAP.

6.4 WATER QUALITY PARAMETERS

Conductivity, temperature, and pH measurements will be made at each water sampling location at the time of sample collection. These field measurements will be made on a sample which is separate and discrete from the sample collected for laboratory analysis. A conventional pH meter with a combination gel-filled electrode or equivalent will be used for field pH determinations. Temperature will be measured using a mercury thermometer. A combination salinity-conductivity-temperature meter or equivalent measurement device will be used for the remaining field parameter measurements. All measurements will be recorded in the field notebook or on an appropriate form.

All instruments will be calibrated to ensure accuracy (see Section 8.0). All probes will be thoroughly rinsed with distilled water prior to any measurements.

A representative water sample will be collected in accordance with procedures specified in the Sampling and Analysis Plan. These procedures have been developed to insure that collection methods result in samples that accurately represent the media being sampled. If possible, measurements of temperature, pH and conductivity will be made at the sampling point; otherwise, samples will be placed in a transfer bottle and measurements will be made as follows:

- o The transfer bottle will be rinsed with sample water prior to filling.
- o Probes will be immediately submerged in the transfer bottle and measurements will be taken accordingly.
- o All field measurements will be recorded in a field notebook along with the sample location and the time and date of measurement.
- o After parameters are obtained, the transfer bottle and the probe(s) will be decontaminated by washing with laboratory detergent, cleaning with methanol and hexane, followed by a final rinse with de-ionized water. If the transfer bottle cannot be cleaned, a new bottle will be used.

7.0 SAMPLE CONTROL, DOCUMENTATION, AND SHIPPING

Samples will be handled in accordance with the general programmatic procedures established in Sections L and M of the REM II Quality Assurance Program Plan. Section L covered the requirements for handling, storage and shipping of samples; Section M, chain-of-custody.

The standard operating procedures for sample type delineation, handling, shipping, chain-of-custody, and related matters are presented in this section. The purpose of these procedures is to maintain the integrity (i.e., quality) of all samples during collection, transportation, analysis, and reporting. Procedures stated herein are necessary to validate the history of sample data from collection through reporting by providing adequate documentation. Procedures described here are from standard EPA sample handling and Contract Laboratory Program protocols. The sample numbering process for identifying individual samples is described within Section 6.2.2 of the Sampling and Analysis Plan.

7.1 SAMPLE TYPE DELINEATION AND HANDLING

The specific procedures for sample handling and labeling are determined by (1) the type of sample collected (i.e., either environmental or hazardous), and (2) if hazardous, the degree of contamination. The degree of contamination or concentration of contamination is specified as low, medium, or high. Sample type delineation for the Ordot Landfill Site is described below. Methods for sample handling are described in CDM procedure 5622001 (Table 5-1).

The groundwater sample will be collected away from known contaminated areas of the landfill and can be treated as a low concentration environmental sample. However, should the sample produce a reading of 10 ppm or greater on the HNu or OVA (instrument probe placed in sample jar or above sample), the sample will be considered as a medium concentration hazardous sample. The decision for sample type determination will be made by the on-site coordinator in consultation with the site health and safety coordinator.

7.2 CUSTODY PROCEDURES AND DOCUMENTATION

Sample identification documents must be carefully prepared so that identification and chain-of-custody can be maintained, and sample disposition can be controlled. The sample identification documents utilized by EPA contractors are:

- o Inorganic and Organic Traffic Reports, including sample identification numbers
- o Region IX Sample Data Sheet
- o Chain-of-custody records
- o Custody seals
- o Field notebooks
- o Special Analytical Services Request forms (for EPA Contract Laboratories)

These items are discussed below.

7.2.1 TRAFFIC REPORT FORM

The Traffic Report forms, described in Section 6.7.3 of the SAP, are the primary forms used for sample identification within the Contract Laboratory Program.

The pre-printed and pre-numbered adhesive sample labels affixed to the Traffic Reports must be secured to the sample containers by the sampler. Forms are filled out with waterproof ink. Where necessary, the label is protected from water and solvents with clear label protection tape.

Each Traffic Report will include the following information:

- o Sample Number
- o Project Code/Case Number
- o Sample Site Name/Code
- o Sampling Date
- o Sampling Personnel
- o Shipping Method and Date
- o Sample Description
- o Sample Matrix and Concentration
- o Sample Volume and Number of Containers
- o Sample Destination
- o Preservatives Used
- o Analyses Required
- o Special Handling Procedures
- o Container Lot Numbers

Upon returning from the field, sample numbers are recorded in the sample log book. Remaining Traffic Reports are distributed to appropriate organizations and personnel. Complete instructions for use of Traffic Reports are given in the User's Guide to the EPA Contract Laboratory Program.

7.2.2 CHAIN-OF-CUSTODY

To document sample possession, chain-of-custody procedures are followed. The procedures used by EPA contractors are outlined in the sections below. Alternative procedures are acceptable provided that proper custody of the samples is maintained and the procedures are approved by EPA personnel in advance.

Field Custody Procedures

- o Collect only enough samples to provide a good representation of the media being sampled. To the extent possible, the quantity and types of samples and sample locations are determined before the actual field work. As few people as possible should handle samples.
- o The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly.
- o The on-site Coordinator determines whether proper custody procedures were followed during the field work and decides if additional samples are required.

Transfer of Custody and Shipment

- o Samples are accompanied by a Chain-of-Custody Record (see Section 6.7.2 of the Sampling and Analysis Plan). When transferring samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer.
- o Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate Chain-of-Custody Record accompanying each shipment (one for each field laboratory). A chain-of-custody seal is placed on each sample container and placed in the shipping container. Shipping containers are padlocked or sealed with Custody Seals for shipment to the laboratory. The method of shipment, courier name(s), and other pertinent information are entered in the "Remarks" section of the Chain-of-Custody Record.
- o All shipments are accompanied by the Chain-of-Custody Record identifying its contents. The original record accompanies the shipment, and the yellow copy is retained by the project manager.
- o If sent by common carrier, a Bill of Lading is used. Air freight shipments are sent collect. Freight bills, Postal Service receipts, and Bills of Lading are retained as part of the permanent documentation.

Laboratory Custody Procedures

- o A designated sample custodian accepts custody of the shipped samples and verifies that the information on the Sample Identification number matches that on the Chain-of-Custody Records. Pertinent information as the shipment, pickup, and courier is entered in the "Remarks" section. The custodian then enters the

Sample Identification number data into a bound log book, which is arranged by project code and station number.

- o The laboratory custodian uses the Sample Identification number or assigns a unique laboratory number to each sample and ensures that all samples are transferred to the proper analyst or stored in the appropriate secure area.
- o The custodian distributes samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received until the sample is exhausted or returned to the custodian.
- o When sample analyses and necessary QA checks have been completed in the field laboratory, the unused portion of the sample must be disposed of properly. All identifying tags, data sheets, and laboratory records are retained as part of the permanent documentation. Sample containers and remaining sample material are disposed of appropriately.

7.2.3 CUSTODY SEALS

When samples are shipped to the EPA contract laboratory, they must be placed in padlocked containers or containers sealed with custody seals to ensure samples are not tampered with. due to the potential for a customs search, seals will be placed on each sample container. In addition, two seals must be placed on each shipping container (cooler), one at the front and one at the back so as to allow the recipient of the container to make a determination as to whether or not the container has been opened. Clear tape should be placed over the seals to ensure that seals are not accidentally broken during shipment.

7.2.4 REGION IX SAMPLE DATA SHEET

As required by Region IX, a sample data sheet will be completed for each sample collected. This data sheet assists in tracking the sample and information regarding sample numbers, case numbers, media, containers, etc., is required. The specifics associated with completing the form is provided in the SAP, Section 6.7.3.

7.2.5 DISTRIBUTION OF COPIES

The distribution of quality control and sample identification documentation will be as follows:

1. Chain-of-Custody Record - original accompanies sample, pink copy to Region IX QAMS, and a photocopy to the sampler's files.
2. Inorganic and Organic Traffic Reports - originals to SMO, second copy (pink to Region IX QAMS), third and fourth copies accompany samples, and a photocopy is made for sampler's files.
3. Sample Data Sheet - send to Region IX QAMS.
4. SAS Packing List - top copy (white) to SMO, second copy (yellow) to Region IX QAMS, third (pink) and fourth (gold) copies accompany samples. Photocopy is made for sampler's files.

QAMS' address is:

U.S. EPA Region IX
QAMS (P-3-2)
215 Fremont Street
San Francisco, CA 94105
Attn: Stewart Simpson

SMO's address is:

U.S. EPA
CLP Sample Management Office
P.O. Box 818
Alexandria, VA 22313

7.3 FIELD NOTEBOOKS

In addition to Sample Identification Numbers and Chain-of-Custody Records, a field notebook must be maintained by the field team leader to provide a daily record of significant events, observations, and measurements during field investigations. The field notebook will contain information such as: personnel present, site conditions, sampling procedures, measurement procedures, calibration records, etc.

The project notebook and will be distributed according to the procedures outlined in Section 11.0. The information contained in the notebook will be summarized and interpreted for use in the PA.

All entries in the field notebooks shall be signed and dated. The field notebooks shall be kept as a permanent record.

These notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project and to refresh the memory of the field personnel if called upon to give testimony during legal proceedings.

7.4 CORRECTIONS TO DOCUMENTATION

As previously stated, all original data recorded in field notebooks, Chain-of-Custody Records, and other forms are written with waterproof ink. None of these documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on a document assigned to one individual, that individual may make corrections simply by crossing a line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on a document should be corrected by the person who made the entry. All subsequent corrections must be initialed and dated.

7.5 SAMPLE SHIPPING

Policies, procedures, and guidelines for shipping of environmental and hazardous samples are presented in CDM Procedure 5622001 (Table 5-1) and in the SAP.

Refer to Section 11.0 for additional information on document control.

8.0 EQUIPMENT CALIBRATION, MAINTENANCE, AND OPERATION

General programmatic requirements for the calibration of instruments are established in Sections E and K of the REM II Quality Assurance Program Plan. As an activity which affects data quality, instrument calibration must be done in accordance with the requirements of Section E for formal written procedures. Section K further requires that instruments be calibrated and maintained to operate within manufacturers' specifications by trained regional personnel.

A variety of instruments, equipment, and sampling tools will be used to collect data and samples and to monitor site conditions. Proper calibration, maintenance, and use of instruments and equipment are imperative to ensure quality of all data collected. A record of calibration and maintenance activities is as important as the data record itself in order to provide legally dependable data. The responsibility for proper equipment calibration and maintenance lies with the REM II equipment manager.

8.1 INSPECTION

All instruments and equipment purchased or used on the REM II program are inspected to ensure that the item meets and performs to project specifications. Instruments meeting requirements of the program are given a control number and made available for site use. Instruments and equipment not meeting program requirements are labeled "hold - not available for use" and are withheld from REM II field use. Such instruments and equipment are not available for use until they can be modified or repaired to meet REM II requirements.

8.2 WRITTEN OPERATING PROCEDURES

The calibration, maintenance, and operating procedures for all REM II instruments, equipment, and sampling tools must be documented in written procedures and incorporated into the REM II Site Investigation Procedures Manual prior to use on any site. These procedures are based on

manufacturer's instructions and common practice and include specifications and criteria for calibration, maintenance, and operation. The specific procedures that will be implemented during the Ordot Landfill site investigations are listed in Table 5-1.

8.3 CALIBRATION

Each piece of equipment used in activities affecting data quality is calibrated at a frequency specified by either the manufacturer's specifications or criteria or limitations established by the REM II program. Where manufacturer's specifications differ from the REM II program criteria, the more stringent calibration schedule will be used.

Written operating procedures have been developed and shall be used to calibrate equipment. These procedures are incorporated in the Site Investigation Procedures Manual and are listed in Table 5-1. They contain as a minimum:

- o Equipment identification
- o Control number
- o Calibration schedule and frequency
- o Equipment specifications
- o Specification verification (where applicable)
- o Equipment necessary to accomplish calibration
- o Procedure for calibration

Instruments and equipment requiring calibration have a calibration sticker affixed which identifies the following information:

- o Date of calibration
- o Next due date for calibration
- o Initials of person performing calibration

- o Any additional information (e.g., instrument settings) required for proper instrument use.

An equipment log sheet, as well as calibration work sheets (where applicable) is kept for each piece of equipment whose performance is affected by use. Equipment log sheets are bound into equipment logbooks and contain:

- o Date of calibration
- o All data pertaining to the calibration procedures
- o Next due date for calibration
- o Initials of analyst performing calibration
- o Adjustments made and the accuracy of the equipment prior to and following calibration
- o Record of equipment failure or inability to meet specifications

If the calibration schedule is not adequately maintained or accuracy as reported in the specification cannot be attained, that instrument is labeled "Hold" and is unavailable for use until repaired so that specifications are attained.

General calibration requirements are presented below.

- o All adjustable, mechanical, electronic, and/or recording instruments will be calibrated prior to entry into the field.
- o Measuring devices such as steel tapes will be calibrated twice each year to check for kinks, stretching, or worn markings.
- o Instruments that cannot be readily calibrated (e.g., sampling pumps) will be performance-checked versus a similar instrument with known performance. If the performance of the instrument varies by more than $\pm 5\%$ it will be returned to the manufacturer for proper maintenance.
- o Instruments that require frequent calibration checks or calibration during use (e.g., pH meters) will be calibrated as specified in their operating procedures.

8.4 MAINTENANCE

Each piece of equipment used in activities affecting data quality is maintained to specifications presented by the manufacturer. REM II Equipment Managers will be responsible for performing routine maintenance and will have available tools and spare parts to conduct routine maintenance. Maintenance items that cannot be performed by the Equipment Manager will be performed by a person certified or trained to repair the instrument.

Written operating procedures have been developed for maintaining instruments. These procedures will be followed to maintain instruments. Instruments will be calibrated to proper specifications following maintenance to ensure proper completion of the maintenance procedure.

The date of maintenance will be recorded on the instrument's calibration tag. A record of maintenance, including a description of specific activities performed, will be made in the equipment logbook. This book is kept in the equipment room with the instrument. Data recorded in the logbook are similar to the data recorded for calibration.

If the equipment or instrument cannot be maintained to manufacturer's specifications or cannot be properly calibrated, it will be returned to the manufacturer or other repair facility for proper maintenance and repair. Once received back from the manufacturer, the instrument is checked for compliance to project specifications before being returned to routine field use.

Maintenance procedures to be used for instruments and equipment on the Ordot Landfill site are presented in Table 5-1. The equipment maintenance schedule is presented in Table 8-1. Critical spare parts are listed in Table 8-2.

TABLE 8-1
EQUIPMENT MAINTENANCE SCHEDULE

Equipment	Maintenance
YSI Model 33 S-C-T Meter	<p>Low readings are indicative of a dirty probe. Clean by soaking in a solution of 10 parts distilled water and 1 part HCl.</p> <p>Batteries should be replaced when it is impossible to red line the instrument. Two "D" size alkaline batteries are needed.</p> <p>Calibrate temperature to a NBS traceable thermometer.</p>
Haake Buchler pH Stick	<p>Rinse probe with distilled water after every use.</p> <p>Make sure absorbent pad at bottom of sheath is kept saturated with pH > solution.</p>
HNU Model PI 101	Clean lamp windows if readings are erratic or low. Recharge batteries after each use. Recalibrate weekly.
Gastechtor Hydrocarbon Survey Meter	Recharge batteries after each use. Recalibrate weekly.
OVA Model 128	Recharge batteries after each use. Recharge hydrogen supply after each use. Recalibrate weekly.
Air Sampling Pumps	Recharge batteries after each use. Calibrate air flow prior to use.
Respirable Dust Monitor	Recharge batteries after each use.

TABLE 8-2
LIST OF CRITICAL SPARE PARTS

Equipment	Part
Haake Buchler pH Stick	pH solutions.
YSI Model 33 S-C-T Meter	Two "D" size alkaline batteries.
HNU Model PI 101	Lamp cleaning compound. Spare gas. Battery charger.
Gastechtor Hydrocarbon Survey Meter	Spare gas. Battery charger.
OVA Model 128	Spare gas. Battery charger.
Air Sampling Pumps	Spare battery. Battery charger.
Respirable Dust Monitor	Battery charger.

8.5 MASTER EQUIPMENT CONTROL RECORD

An inventory control system including all equipment and instrumentation used by the REM II is maintained by the equipment manager as the basis for maintenance and calibration control. The inventory control documentation includes for each item:

- o Description of item.
- o Manufacturer, model number, and serial number.
- o Identification Number.
- o Name, address, and telephone number of company which services item.
- o Type of service policy.
- o Timing and frequency of routine maintenance, servicing, and calibration.

9.0 ANALYTICAL PROCEDURES

General programmatic requirements for analytical procedures are established in Section E and N of the REM II Quality Assurance Program Plan. Section E establishes the need for formally documented procedures. Section N requires:

- o The use of Contract Laboratory Program (CLP) laboratories and analytical procedures for all enforcement, litigation, and evidentiary data.
- o The specification of analytical procedures in the project operations plan for all engineering data (screening field samples, pilot laboratory studies) and non-CLP generated data.

Analytical procedures for samples to be analyzed by CLP laboratories are specified in the CLP contract. Procedures for collection and handling of all samples are specified in the Sampling and Analysis Plan and are listed in Table 5-1.

Samples collected will be analyzed by a Contract Laboratory Program (CLP) laboratory through Routine Analytical Services (RAS) and special Analytical Services (SAS) requests. A list of all analytical procedures to be followed by the CLP is presented in Table 9-1. A list of analytical methods for air quality parameters of interest is presented in Table 9-2. A description of the requirements of the contract laboratory is presented below.

9.1 GENERAL LABORATORY REQUIREMENTS

The purpose of the EPA Contract Laboratory Program is to provide analytical data of consistent and known quality from which to determine the nature and extent of contamination, base assessments of risk, institute remedial actions, or initiate enforcement actions to identify and mitigate threats to public health and environment. Protocols and methodologies are designed by the EPA to provide data of known quality in strict accordance with quality assurance procedures and chain-of-custody and document control requirements. Information on the types of samples which are analyzed is presented in the User's Guide to the EPA Contract Laboratory Program.

TABLE 9-1
CONTRACT LABORATORY PROGRAM ANALYTICAL PROCEDURES

PARAMETER	MATRIX	METHOD	REFERENCE
RAS Volatile Organics	Water	IFB for Organics	WA85-J680
RAS Semi-Volatile Organics	Water	IFB for Organics	WA85-J680
RAS Pesticides/PCB's	Water	IFB for Organics	WA85-J680
RAS Inorganics	Water	IFB for Inorganics	WA85-J838
RAS Cyanide	Water	IFB for Inorganics	WA85-J838
SAS Organics	Air	TO-1, TO-2, TO-5	EPA
SAS Organics	Air	5023, 5503, 5515	NIOSH

EPA/NIOSH Methods = Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, EPA-600/4-84-041, Apr. 1984.

TABLE 9-2
AIR SAMPLING METHODS SELECTION MATRIX

Target Air Compounds	NIOSH METHODS			EPA METHODS		
	5023	5503	5515	TO-1	TO-2	TO-5
Acetone						X
Benz[o]Anthracene			X			
Benzene				X	X	
Bromodichloromethane*				X		
Bromoform				X		
Carbon Tetrachloride					X	
Chlorobenzene				X		
Chloroform					X	
Chrysene			X			
Dibromochloromethane*						
1,1 Dichloroethane					X	
1,1 Dichloroethylene					X	
1,2 Dichloroethylene					X	
Trans 1,2 Dichlorobenzene**						
Dichlorobenzene				X ¹		
Ethyl Benzene				X		
Methanol						X
Methylene Chloride						X
Methyl Ethyl Ketone						X
Napthalene			X			
Phenol				X		
Tetrachloroethylene				X		
Trichloroethane					X ²	
Trichloroethylene				X	X	
Toluene				X	X	
Xylene				X		
PCBs			X			
Coal Tar Pitch Volatiles	X					

*No method found, placed with halogenated hydrocarbons group - i.e., Bromoform

**No method found, placed with high vol. organics

¹As "1,4"

²As "1,1,1"

Methods Reference: U.S. EPA, 1984. Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air. EPA-600/4-84-041.

In general, the laboratory will adhere to those recommendations as promulgated in 21 CFR Part 58, "Good Laboratory Practices", criteria described in "Methods for Chemical Analysis of Water and Wastes", 1979 (EPA-600/4-79-020), the requirements of the EPA Contract Laboratory Program, and those presented in 40 CFR 136, "Guidelines Establishing Test Procedures for Analysis of Pollutants under the Clean Water Act." The general practices required of a CLP laboratory are presented below.

1. Purity of Standards, Solvents and Reagents

All reagents will be of the standard laboratory quality obtainable. Where applicable, reference standards solutions will be traceable to National Bureau of Standards (NBS). Each new lot of reagent grade chemicals shall be tested for quality of performance. These shall be tested by injection into a gas chromatograph (GC) to determine the extent of interferences in the GC profile.

2. Glassware

For organic analyses, the only acceptable sample container is amber glassware with a teflon-lined cap. All glassware used in organic analyses requires special cleaning. Preparation of glassware and other sample containers is described in CDM Procedure 5622006 (Table 5-1).

3. Analytical Analyses

- a. Laboratory pure water is prepared by a special deionized water system augmented by individual filter cartridges and polishers located at each outlet point. The polishers include special particulate filters, organic resins, and inorganic resins.
- b. Specially deionized water which has been boiled and purged with nitrogen gas will be used for volatile/priority pollutant analyses. Water prepared in this manner should be free of contamination and must be free of interference peaks when injected into the gas chromatograph.

c. Field Blank

All water samples submitted for volatile organic contaminants or priority analysis must be accompanied by a field blank. Field blanks are prepared in the field prior to shipment to the laboratory, using organic-free water. They are stored alongside the collected samples and shipped back to the laboratory for analysis. Field blanks are analyzed with the field samples and they indicate whether the sample bottles

were exposed to contaminants during handling and transit or if samples were cross-contaminated. The laboratory should not be told which sample is the field blank.

d. Method Blank/Reagent Blank

- 1) A Laboratory pure water blank is analyzed along with all water samples submitted for analyses. The method blank is processed through all procedures, materials, and labware used for sample preparation.
- 2) In cases of non-aqueous samples, reagent blanks serve as method blanks.

e. Calibration Standards

A calibration standard is prepared in the laboratory by dissolving a known amount of a pure compound in an appropriate matrix. The final concentration calculated from the known quantities is the true value of the standard. The results obtained from these standards are used to generate a standard curve and thereby quantify the compound in the environmental sample. A minimum of three (3) calibration standards will be used in generating a standard curve for all analyses. Specific requirements are outlined in the EPA Contract Laboratory Program.

f. Check Standard

A check standard is prepared in the same manner as a calibration standard. The final concentration calculated from the known quantities is the true value of the standard. The important difference in a check standard is that it is not carried through the same process used for the environmental samples, but is injected directly onto the gas chromatographic column. A check standard result is used to validate an existing concentration calibration standard file or calibration curve.

The check standard can provide information on the accuracy of the total analytical method independent of various sample matrices. Specific requirements and procedures for calibration and check standards are outlined in the EPA Contract Laboratory Program.

g. Control

A control is a sample of known value used to validate the analytical procedure. Control samples are prepared by the unit supervisor or his delegate and used each time a determination is made. One control is used for every ten samples and the value obtained must fall within $\pm 10\%$ of the true value for validation.

h. Spike

A sample spike is prepared by adding a known amount of a pure compound to the environmental sample (before extraction for extractables), and the compound is the same or similar (as in isotopically labelled compounds) as that being assayed for in the environmental sample. These spikes simulate the background and interferences found in the actual samples and calculated percent recovery of the spike is taken as a measure of the accuracy of the total analytical method. When there is no change in volume due to the spike, it is calculated as follows:

$$P = \frac{100 (O-X)}{T}$$

P = Percent Recovery

O = Measured value of analyte

X = Measured value of analyte
concentration in the sample before
the spike is added

T = Value of spike

Tolerance limits for acceptable percent recovery are established in the EPA Contract Laboratory Program.

i. Internal Standard

Internal standards are prepared by adding a known amount of pure compound to the environmental sample, and the compound selected is not one expected to be found in the sample, but is similar in nature to the compound of interest. Internal standards are added to the environmental sample just prior to analysis. (Note: Internal standards and surrogate spikes are different compounds. The internal standard is for quantification purposes using the relative response factor, while surrogate spikes indicate the percent recovery and therefore the efficiency of the methodology.)

j. Matrix Spike/Duplicate

Aliquots are made in the laboratory of the same sample and each aliquot is treated exactly the same throughout the analytical method. Spikes are added at approximately 10 times the method detection limit. The percent difference between the values of the duplicates, as calculated below, is taken as a measure of the precision of the analytical method.

$$PD = \frac{2 (D_1 - D_2)}{(D_1 + D_2)} \times 100$$

PD = Percent Difference

D₁ = First Sample Value

D₂ = Second Sample Value (duplicated)

The tolerance limit for percent differences between laboratory duplicates should not exceed 15 percent for validation.

k. Quality Control Check Samples

Inorganic and organic control check samples are available from EPA Cincinnati free of charge and shall be used each quarter as means of evaluating analytical techniques of the analyst.

9.2 DATA REQUIREMENTS

Compounds to be analyzed by the contract laboratory include the Routine Analytical Services (RAS) series for volatile and semi-volatile organics, pesticides, inorganic metals, and cyanide. Procedures for these analyses are specified by the EPA for the contract laboratory program. Data requirements, reporting, and analytical documentation for Special Analytical Service requests for air sampling analyses will be the same as that required for RAS documentation.

9.3 LABORATORY PERFORMANCE

EPA Contract Laboratory performance is continually monitored through ongoing Quality Assurance evaluation conducted by the Environmental Monitoring and Systems Laboratory/Las Vegas (EMSL/LV). These evaluations consist of periodic reviews of analytical data and supporting documentation complemented by quarterly on-site laboratory inspections.

On-site laboratory evaluations ensure continuing laboratory adherence to analytical and QA/QC procedures and that overall performance meets the requirements of the EPA Contract Laboratory Program. EMSL/LV also supports

the EPA Contract Laboratory Program by developing and/or approving all methods, standards and protocols used by contract laboratories.

9.4 ANALYTICAL DATA REVIEW

Data validation will be performed on the data received from the analytical laboratory to ensure that all of the contract Quality Control (QC) criteria have been met. Every component of the data package will be inspected. A series of QC forms will be supplied with the analytical data package and will be used as part of the EPA data review process.

10.0 DATA REDUCTION, VALIDATION AND REPORTING

10.1 DATA LOGGING AND ANALYSIS

Upon receipt of samples for analysis (as accompanied by a completed request for analysis form, Organics Traffic Report or SAS packing slip, and chain-of-custody detailing requested analysis), the laboratory supervisor or his delegate will:

- o Verify all paperwork, chain-of-custody forms, and similar documentation.
- o Log in samples, assign unique log numbers, and attach the numbers to the sample container(s).
- o Open project file and enter data into the file.
- o Assign priority and hazard rating criteria.
- o Store samples in a refrigerated sample bank.

The samples will then be analyzed for requested constituents following specified EPA procedures. The CLP will report values for each sample and provide results of QC sample analysis.

10.2 DATA VALIDATION

Data quality and utility depends on many factors, including sampling methods, sample preparation, analytical methods, quality control, and documentation. The EPA criteria divide physical and chemical data into three categories, as follows:

1. Unusable
2. Level A: sufficiently reliable for development of study plans, evaluating sampling techniques, and identifying gaps in a data base.
3. Level B: meet all criteria and can therefore be used to evaluate potential risks and solutions.

All field data collected by CDM and CLP analytical data are required to be Level B (i.e., they must satisfy all criteria). The following procedures for data validation should be carefully reviewed before data collection begins to ensure adequate documentation and acceptable methodologies. Subcontractors, such as laboratories or sampling personnel, should be advised of all applicable documentation and procedural requirements.

Once the data are assembled, satisfaction of all criteria will be documented as listed below. Chemical data must meet criteria of (1) quantitative statistical significance, (2) custody and document control, and (3) sample representativeness. Physical data include (1) sampling location, time and personnel, (2) documentation, and (3) methodologies.

Documentation may be either direct (e.g., listing of dates, names, methodologies, etc.) or by reference to existing documents. Any reference documents will be specifically identified. The precise and retrievable location of any non-standard documents (e.g., in-house procedures manuals, chain-of-custody forms, laboratory reports) will be stated.

To determine the quantitative statistical significance of chemical data, the following items will be documented as appropriate:

1. Laboratory/field instrumentation, including calibration data, standard methods and references;
2. Proper sample bottle preparation;
3. Laboratory analysis methods, including reference method;
4. Laboratory analysis detection limits;
5. Verification of standards using EPA or NBS reference materials not less than once each three months;
6. Analysis of laboratory (reagent) blanks at a frequency of at least one per 20 samples;
7. Analysis of laboratory spikes at a frequency of at least 1 per 20 samples if the analyte is amenable to spiking (e.g., there is not method for spiking pH);
8. Analysis of field replicates (duplicates or splits) at a frequency of at least 1 per 20 samples for each matrix;

9. Analysis of laboratory replicates (duplicates or splits) at a frequency of at least 1 per 20 samples;
10. Presentation of tabulated QC data or QC charts/acceptance criteria;
11. QA/QC certification of the laboratory and/or participation in round-robin testing by and/or with EPA-accredited agencies;
12. QC limits shall be consistent with the limits established for EPA's contract laboratory program;
13. Companion sampling efforts such as crops or livestock.

To evaluate the custody and document control for samples and results the following items will be documented:

1. Field custody noted in field logbook or transfer-of-custody documentation available;
2. Samples hand delivered to laboratory or transfer-of-custody documentation available;
3. Laboratory custody documented by transfer-of-custody documentation from either field personnel or shipper;
4. Laboratory custody documented through designated laboratory sample custodian with secured sample storage area;
5. Sample designation number(s) traceable through entire monitoring system;
6. Field notebooks and all custody documents stored in secure repository or under the control of a document custodian;
7. All forms filled out completely in indelible ink without alterations except as initialed;
8. Identity of sample taker;
9. Date of sample collection, shipping, and laboratory analysis.

In some cases, the handling of a sample while in the custody of one individual may not be properly documented. In addition, written documentation of transfers of custody between two individuals may be lost. In such cases, it may be necessary to rely on the custodian's verbal testimony that the sample remained secure or that a transfer was made to

another individual. If there is any chance that the custodian's testimony will be seen as unreliable, the data produced as a result of that sample will be rejected.

To determine sample representativeness the following items must be checked:

1. Compatibility between field and laboratory measurements or suitable explanation of discrepancy;
2. Analysis within time limits suitable for the preservation and analysis methods used;
3. Sample storage within suitable temperature, light, and moisture conditions;
4. Proper sample containers used (i.e., inert);
5. Proper sample collection equipment used (i.e., inert); properly decontaminated; not biased;
6. Proper sample preservation techniques used;
7. Proper laboratory preparation techniques used (e.g., grinding, sieving, drying, digestion);
8. A comprehensive evaluation of all factors indicates data was not prescreened by any party using different criteria than that contained herein (bias screening);
9. Sample site selection criteria provide representativeness.

To evaluate the physical data that supports the analytical data, the following items will be documented:

1. Sampling date and time;
2. Sampling team; observation taker and recorder, team leader;
3. Sampling location;
4. Physical description of sampling location (e.g., tilled, rangeland, type of crop, monitoring well type, portion of plant sampled, etc.);
5. Sampling depth increment for soils (if applicable);
6. Sample collection technique;

another individual. If there is any chance that the custodian's testimony will be seen as unreliable, the data produced as a result of that sample will be rejected.

To determine sample representativeness the following items must be checked:

1. Compatibility between field and laboratory measurements or suitable explanation of discrepancy;
2. Analysis within time limits suitable for the preservation and analysis methods used;
3. Sample storage within suitable temperature, light, and moisture conditions;
4. Proper sample containers used (i.e., inert);
5. Proper sample collection equipment used (i.e., inert); properly decontaminated; not biased;
6. Proper sample preservation techniques used;
7. Proper laboratory preparation techniques used (e.g., grinding, sieving, drying, digestion);
8. A comprehensive evaluation of all factors indicates data was not prescreened by any party using different criteria than that contained herein (bias screening);
9. Sample site selection criteria provide representativeness.

To evaluate the physical data that supports the analytical data, the following items will be documented:

1. Sampling date and time;
2. Sampling team; observation taker and recorder, team leader;
3. Sampling location;
4. Physical description of sampling location (e.g., tilled, rangeland, type of crop, monitoring well type, portion of plant sampled, etc.);
5. Sampling depth increment for soils (if applicable);
6. Sample collection technique;

7. Field preparation techniques (e.g., sieving, compositing, etc.);
8. Visual classification of sample using an accepted classification system (if applicable);
9. A thorough description of the methodology used, and a rationale for the use of that methodology;
10. Complete documentation of record-keeping practices;
11. Field notebooks and all custody documents stored in a secure repository or under the control of a document custodian;
12. All forms filled out in indelible ink without alterations except as initialed.

10.2.1 ANALYTICAL DATA

The validation of the analytical data will be performed in accordance with the Standard Operating Procedures for Evaluating Hazardous Waste Data established and adopted by the EPA, and the accuracy and precision criteria outlined in the EPA Contract Laboratory Program (CLP) for analysis of chemical data. Data validation requirements for SAS air sampling analyses will be identical to these requirements. These procedures specify the documentation needed and the technical criteria required to validate the data. The criteria are described below (some definitions have already been presented in Section 4.0, and are repeated here for convenience).

- o Completeness of analytical data. This criterion is a measure of the amount of valid data obtained from the measurement system compared with the amount that was expected under normal conditions. This criterion is expressed as a percentage.
- o Correctness of analytical data. This criterion is simply a check on all mathematical calculations, data transposition, units of measure, and significant figures.
- o Accuracy. The degree of agreement of a measurement (or an average of measurements of the same parameter), X , with an accepted reference or true value, T . This is usually expressed as the difference between two values, $X-T$, or the difference as a percentage of the reference or true value, $100 (X-T)/T$, and sometimes expressed as a ratio, X/T . Accuracy is a measure of bias in a system.
- o Precision. This criterion measures the reproducibility of a measurement. Precision may also be reported relative to some measurement of dispersion such as standard deviation.

- o Representativeness. In a laboratory setting, this criterion is usually evaluated according to the data's credibility, based on the QC officer's past experience with similar samples.

Accuracy is defined by the Contract Laboratory Program as a percent recovery for a spiked sample for organic analyses. Both matrix spikes and surrogate spikes are used to evaluate the data for accuracy. Matrix spikes are actual samples spiked with a representative group of hazardous substances list compounds. One sample for each set of samples or for each twenty samples (whichever is the more frequent) is required to be split for matrix spike analysis.

Precision is defined by the EPA Contract Laboratory Program as the relative percent difference of matrix spike recoveries for two matrix spikes of the same sample (matrix spike and matrix spike duplicates recoveries).

Validation of all analytical data will be performed by EPA Region IX staff. Laboratories will be required to submit results which are supported by sufficient back-up data and QA/QC results to enable the reviewer to conclusively determine the quality of the data. Validity of all data will be determined based on the criteria described above. Upon completion of the review, the reviewers will be responsible for developing a QA/QC report for each analytical data package. This report along with a field activities documentation report will be submitted to the EPA Regional Site Project Officer summarizing the results obtained for all samples collected. The Regional Site Project Officer will forward the results to the Site Manager. All data will be distributed, stored and maintained according to the procedures outlined in Section 11.0. Where test data have been reduced, the method of reduction will be described in the report.

10.2.2 FIELD MEASUREMENT DATA

Validation of data obtained from field measurements will be performed by the project hydrogeologist and the On-Site Coordinator. Validity of all data will be determined by checking calibration procedures utilized in the field, and by comparing the data to previous measurements obtained at the

specific site. Large variations (greater than 10 percent) will be examined in association with changes in local groundwater or soil conditions and general trends. Variations in data which cannot be explained will be assigned a lower level of validity and will be used for limited purposes. The project hydrogeologist and the On-Site Coordinator will summarize the data obtained from field measurements and will include this information in the field activities documentation report which will be submitted to the Site Manager and Regional Site Project Officer for review.

10.3 FINAL REPORTING AND REPORT ARCHIVAL

Upon successful completion of the data validation process, all data generated at the Ordot Landfill Site will be entered into REMTECH, the REM II technical data base. Data will be available for analysis by the site manager and authorized personnel using a site-specific access code. Data summaries and results will be submitted in final report form. This report will consist of all pertinent sample and project information; it will also make specific reference to analytical procedures.

Copies of all analytical data and/or final reports are retained in the laboratory files and, at the discretion of the laboratory manager, data will be stored on computer disks for a minimum of one year.

After one year or whenever the data becomes inactive, the files will be transferred to archives in accordance with Standard Laboratory Procedure. Data may be retrieved from archives upon request.

11.0 DATA MANAGEMENT AND DOCUMENT CONTROL

11.1 INTRODUCTION

11.1.1 PURPOSE OF DATA MANAGEMENT

This section specifies the procedures to be followed in handling data and documents for the Ordot Landfill Site. These procedures will ensure that all data and documents can be located by project personnel at any time, all data and documents are physically accounted for, confidential data and documents are protected from unauthorized access, and project records are properly archived at the end of the study. These procedures will be collectively referred to as the Data Management Plan.

11.1.2 SCOPE OF DATA MANAGEMENT PLAN

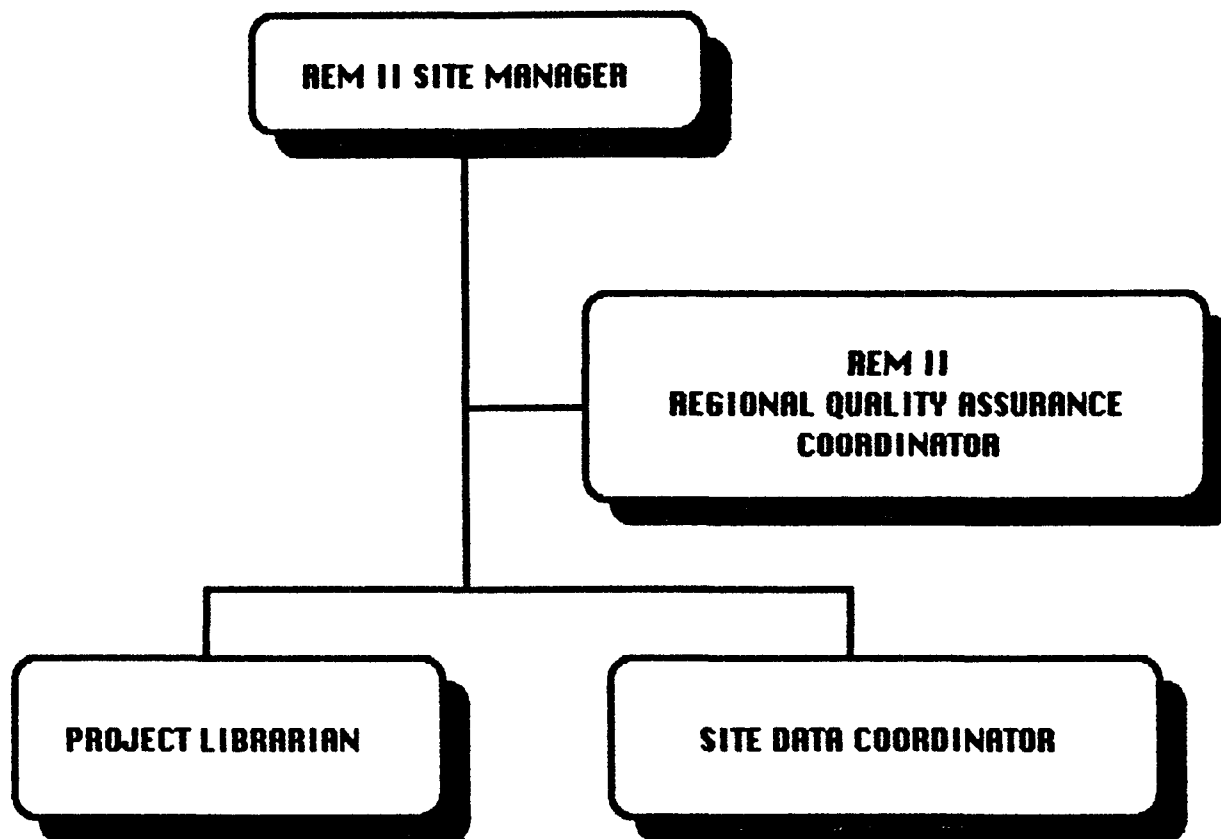
The Data Management Plan describes the data management personnel for the project and their responsibilities, the types of documents to be managed under this plan, and the procedures to be followed in managing them. The procedures include field procedures, document numbering and control, library filing and checkout, computer data base storage, and archiving of the data at the end of the project.

11.2 DATA MANAGEMENT PERSONNEL

11.2.1 DATA MANAGEMENT ORGANIZATION

The data management organization is shown in Figure 11-1. At the top of the organization is the REM II Site Manager. Reporting to him are the Field Data Coordinator and the Project Librarian. Since data management is closely related to Quality Assurance, the REM II QA Coordinator is also shown as interfacing with the Data Management Organization.

The general responsibilities of each person are described below.



ORDOT LANDFILL, GUAM

DATA MANAGEMENT ORGANIZATION

CAMP DRESSER & McKEE INC.

Fig.11-1

11.2.2 REM II SITE MANAGER

The REM II Site Manager has the responsibility for appointing the Field Data Coordinator and the Project Librarian and for ensuring that proper facilities are made available for them to carry out their responsibilities (e.g. adequate space for the project library). The site project manager has responsibility for the overall document control program and is responsible for the maintenance of the document control system. Project personnel are responsible for project documents that are removed from the Library or files while working on the RI.

11.2.3 FIELD DATA COORDINATOR

The Field Data Coordinator is responsible for ensuring that all data management procedures are correctly followed in the field. In general, he/she will be responsible for ensuring that all documents and samples have the appropriate identification numbers (described below under the headings "Document Control" and "Field Procedures") and are properly marked. This person will also keep a record of the custody of all documents and samples while they are in the field.

11.2.4 PROJECT LIBRARIAN

The Project Librarian is responsible for filing all project data, maintaining custody records for project data, ensuring that all project data that are submitted to the library are physically accounted for, and for assisting project personnel in data management procedures.

A computerized document control system has been established for the REM II contract (explained below in Section 11.3). The Project Librarian will use this system and will be the principal point of contact with the document control system for other project personnel. The Project Librarian will obtain needed document numbers, advise personnel on effective use of the system, and ensure that all procedures required by the system are implemented.

11.3 DOCUMENT CONTROL PROCEDURES

11.3.1 INTRODUCTION

In order to keep track of the documents to be produced by REM II, a project document control system has been developed. The purpose of document control is to assure that all documents have an identifying number assigned in a consistent way and to ensure that a central record of all project documents is maintained.

The document control system and general instructions for its use are presented in the REM II Management Plan and are not repeated here.

In general, the author of a document is responsible for requesting a document number. However, the Project Librarian will be available to assist and will usually obtain the document number at the request of the author. In the case of field documents (e.g. field logs), the Field Data Coordinator will request or obtain the necessary document numbers.

11.3.2 DOCUMENT TYPES AND IDENTIFYING CODES

Each work product (correspondence, log books, calculations, telephone reports, etc.) connected with REM II is an accountable document and will be assigned a document number. Part of that number is a code identifying the type of the document. Codes for some of the anticipated document types have been established. They are:

AL ANALYTICAL LOG BOOKS
CN CALCULATIONS/NOTES
CC CHAIN-OF-CUSTODY REC
CL CHECK-OUT LOGS
CA CONFIDENTIALITY AGMT
DM CONFLICT DISCLOSURE
CD CORP. CONFLICT DEC.
DD DOCUMENT OF DECISION
EC EPA CONTRACTS

ME MEDICAL RECORDS
MT MEET./TELE. REPORTS
PS PLANS AND SPECS
PO PRICE QUOTATION
PL PROJECT LOG BOOKS
QA QUALITY ASSURANCE
QC QUALITY CONTROL
RT REPORTS
RP REQ. FOR PROPOSALS

EP EPA CORRESPONDENCE
EN EQUIP. INVENTORY
FD FIELD DATA RECORDS
FI FINANCIAL STATEMENTS
FC FUTURE CONTR. DETER.
IN INDUSTRY CORRES.
CM INT. STA. OF CONFLICT
IO INTRA-OFFICE CORRES
IV INVOICES
LI LITIGATION DOCS.
SK LOE SUBCONTRACTS

SI SAMPLE ID DOCUMENTS
SN SAMPLE INVENTORY
ST STATE CORRESPONDENCE
PK SUB-POOL CONTR.
SP SUB-POOL CORRES.
SC SUBCONTRACTOR COR.
RE TEAM RESUMES
TP TECH/COST PROPOSALS
WA WORK ASSIGNMENTS
WP WORK PLANS
WM WORK PLAN MEMORANDA

11.4 FIELD DATA MANAGEMENT AND SAMPLE CONTROL

11.4.1 GENERAL PROCEDURES

Proper document and sample control is crucial to enforcement actions because the EPA's case in a formal hearing or criminal prosecution often hinges on evidence gathered by others. Therefore, detailed field records of inspections and investigations must be kept. All information pertinent to field activities must be recorded in the appropriate forms, field logbooks, sample tags, traffic reports, and sample chain-of-custody documents. All of these documents will be numbered. The Field Data Coordinator will keep a record of all the field documents relevant to a particular investigation, note who has custody of them at all times, and ensure that they are properly filed in the Project Library at the end of the investigation. The sections below detail the specific procedures for each type of document.

11.4.2 FIELD LOGBOOKS

All field measurements, observations, and other information pertinent to a field activity will be recorded in field logbooks.

A document number will be obtained for each logbook by the Field Data Coordinator before the logbook is used. The document numbers will be

recorded by the Field Data Coordinator. The logbook will be filed in the project library as soon as a document number is obtained (i.e., before any data is entered into it). It will then be checked out by the Field Data Coordinator for use in the field. Whenever custody of a logbook changes, the Field Data Coordinator will record the change of custody in the appropriate logbook.

The logbooks will be bound books with consecutively numbered pages. All pages in the logbooks will be accounted for. No pages are to be removed.

Entries in the logbooks are to be made in waterproof ink. Entries will be made legibly, and signed and dated. Each entry should include the sample location, field measurements taken, station number, and sample identification number. All in-situ measurements and field observations are recorded with all pertinent information necessary to explain and reconstruct field activities. Any changes to entries are to be made in a way that does not obscure the original entry. The reason for the change is to be noted and the change is to be signed and dated at the time it is made.

The Site Manager and the On-site Coordinator are responsible for ensuring that field notebooks and data forms are used during all monitoring activities and are stored safely. Any lost, damaged or voided field notebooks or data forms are reported to the Site Manager. Photographs that show field activities and monitoring locations are numbered to correspond to field notebook or data form entries. The names of the photographer and witness, date, time, site location, and site description are entered sequentially in the notebook. If a recognizable or standard scale is not included in the photograph, the field of view and distance to the subject is also noted. Once developed, the prints are labelled and stored correctly.

11.4.3 SAMPLE CONTROL

The Field Data Coordinator will ensure that all samples are properly tagged and recorded, and that the proper chain of custody procedures are followed at the site.

If a sample identification number is lost in shipment, or was never prepared for a sample(s), or a properly labeled sample was transferred without a formal Chain-of-Custody Record, a written statement is prepared detailing how the sample was collected, air-dispatched, or hand-transferred to the laboratory. The statement will include all pertinent information, such as entries in field notebooks regarding the sample and whether the sample was in the sample collector's physical possession or in a locked compartment until hand-transferred to the laboratory. Copies of the statement are distributed to the site manager.

Chain-of-custody procedures have been established for the Ordot Landfill Site and are described in Section 7.2 of this QAPP. These procedures must be followed whenever samples are collected, transferred, stored, analyzed, or destroyed. The primary objective of these procedures is to create an accurate written record which can be used to trace the possession and handling of the sample from the moment it is collected, through analysis, and through introduction as evidence (if required).

Each time a sample changes custody, the appropriate notation must be made in the chain-of-custody documents.

Before the release of a final analytical report, each laboratory assembles documents and cross-checks information on corresponding sample identification numbers, Chain-of-Custody records, bench sheets, laboratory logbooks, and other logbooks to ensure that data pertaining to each particular sample are complete and consistent throughout the record. The field data coordinator then cross-checks field documents to ensure the information recorded corresponds with that of the laboratories and is consistent throughout the project record.

11.5 PROJECT LIBRARY PROCEDURES

11.5.1 GENERAL LIBRARY PROCEDURES

The Project Librarian will be responsible for administering the project

library. Documents to be filed include notebooks, log books, test analyses, calculation briefs, maps, diagrams, photographs, support reports, references, lab reports, and project reports. All project documents are to be filed in the library as soon as they are completed. By immediately filing all documents, it will be possible to maintain physical control over their location, to ensure that they are available for use by all members of the project team, and to make certain that they will be available at the end of the project for any future site actions.

Each document filed in the library will have an assigned document number. It is the responsibility of the originator of the document to ensure that a document number has been obtained, although the Project Librarian will assist in obtaining document numbers. Once a document number has been obtained, the document will pass into the custody of the Project Librarian for filing.

The Project Librarian will establish a system for checking out documents. The procedures will record the document number(s), the name and signature of the person checking out the document, the date, and the time the document is checked out. No documents are to be removed from the library without established checkout procedures. All documents will be checked back into the library upon their return.

11.5.2 FILING PROCEDURES AND CONFIDENTIAL FILES

Separate files will be maintained for the Ordot Landfill Site. They will be separated by document type, with the most current document on the top of the file.

All confidential files are to be marked as confidential and filed in a separate file. The REM II Site Manager will determine who is to be allowed access to confidential files. The Project Librarian will establish procedures for ensuring that only those authorized personnel have access. Confidential documents can be removed from the Project Library by authorized personnel only after the Project Librarian informs the person removing the documents that 1) they are confidential, 2) they are to be

stored in a locked file when not in use, and 3) only authorized personnel are to have access to them. It is then the responsibility of the person removing the documents to ensure that only authorized personnel have access to them.

11.5.3 CONFIRMATION THAT DOCUMENTS ARE FILED IN THE LIBRARY

Document control numbers will be obtained by the author of a document before it is filed in the Regional Project Library. Between the time that the document control number is obtained and the time that the document is actually filed, it must be properly accounted for.

The document control system has a status function that indicates if the document has been filed in the library. When the document is filed in the Regional Project Library, the librarian will change the filed status from 'N' to 'Y' to confirm that the document has been filed in the library.

If the librarian has changed the "filed" status to 'Y', it will be indicated on the index; thus confirmation is complete. If the 'filed' status indicated 'N', then the document will be located and accounted for.

Periodically, the REM II Regional Project Librarian will cross-check for missing documents. Additionally, periodic physical inspection of Regional files will take place to ensure compliance with stated criteria.

11.5.4 EPA ENFORCEMENT CLASSIFICATIONS AND HANDLING PROCEDURES

Documents that are classified by EPA as enforcement materials will be handled according to procedures described below. EPA divides enforcement materials into three classifications:

- o General Enforcement
- o Enforcement Confidential
- o Enforcement Sensitive

"Enforcement Sensitive" are all materials that contain information directly related to the government's case. These materials include names of informants, identification of witnesses and their testimony, settlement positions, discussions or analyses of potential weaknesses in the government's case, and other similar information.

"Enforcement Confidential" are all materials that have not been reviewed or checked for accuracy, and thus should not be generally distributed or otherwise made public. These materials include draft documents, results of analyses that have not been verified, internal memoranda, and other similar documents.

"General Enforcement" materials are all other materials that are accumulated during the development of an enforcement case. These include materials that document statutory or regulatory violations.

All enforcement files are secured in locked file cabinets or equally secure areas during other than normal working hours, unless files are personally attended by a person authorized to have access to such files.

A continuous and permanent record is maintained of all persons who access enforcement files, including for each file: person having access, data and period of access, and location of file.

Any employee who is not a member of the project staff or management is not allowed immediate or direct access to enforcement files without approval of the responsible site manager or other designated management staff.

11.6 COMPUTER DATA STORAGE

11.6.1 USE OF COMPUTER DATA BASES

Computer data bases will be used during the project for both archiving and analysis of data. A central data base, System 1032 (described below), has been established by the REM II National Program Management Office (NPMO) to store all data collected by all projects. Data can be copied from this

data base to local data bases or files for further analysis or modeling. Local data bases include various microcomputer software systems with searching, reporting, mapping and graphics capabilities.

11.6.2 CENTRAL DATA BASE

All data will be stored on computer files using the "System 1032" software package. System 1032 is a standard and widely used relational database marketed by Software House in Cambridge, Massachusetts. The package has been designed for storing all the analytical data from REM II applications. This design includes file structure and validity checks. The System 1032 central data base is installed on the Digital Equipment Corporation VAX 11-750 computer in Annandale.

All REM II project data will be entered into System 1032. After it has been entered, it can then be retrieved and used for analyses. Under no circumstances will data be used for analysis unless it has been entered in the System 1032 and retrieved. There are two reasons for this. First, the software includes validation procedures to check all entries. It will flag entries which fall outside of reasonable bounds as possible errors. Entries such as site codes, social security numbers of project personnel, chemical names, and sampling methods will be verified against master lists within the data base. Actual data entry will be verified using standard quality control procedures. Unless data is entered in System 1032 before its use in an analysis, the results of the analysis will be questioned. Second, the act of entering all data in System 1032 before its use will ensure that all data has been sent to the NPMO for preservation.

The software will produce output files that can be used with other application programs on the VAX (models written in FORTRAN, for example). The output files can also be transferred to other computers and microcomputers so that they can be used with other approved models.

11.6.3 LOCAL DATA BASES

Two computer systems will be available for use on the project: a Digital

Equipment Corp. Rainbow microcomputer and an IBM XT microcomputer. Data files can be stored and manipulated on these computers. Files can also be transferred between these computers.

Data will be stored and manipulated on the IBM using the dBase III data base system. This is a relational data base system with extensive searching and reporting capabilities. Mapping and graphics capabilities are available on the IBM or Rainbow through Lotus 1-2-3 or Surface II software.

All data files will be verified by standard QC checks on data entry and by processing through the central data base.

11.6.4 DATA BACKUP

The IBM computer hard disk files are backed up every week on floppy disks. These disks are preserved for 25 weeks. If a particular analysis requires more frequent or longer term backup, it is the responsibility of the analyst to arrange for it.

Data stored on the Rainbow will be stored in floppy disk. The primary disk will be copied frequently and stored in a separate place to provide backup for the Rainbow data files.

11.7 DATA ARCHIVING

All project data will be archived at the end of the project to ensure that they are physically preserved and to ensure that they are available to support future actions at the site.

All computer files held at CDM will be printed out in hard copy form and transferred to magnetic tape or disk. The hard copies, tapes, and disks will be placed in the library and indexed along with the other documents. It will be the responsibility of NPMO to archive all project files maintained on the VAX. It is anticipated that the entire library will then be transferred to the custody of the NPMO for preservation.

12.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

General programmatic requirements for internal quality control (QC) checks are established in Sections E, I and P of the REM II Quality Assurance Program Plan.

12.1 QUALITY CONTROL CHECKS FOR LABORATORY ACTIVITIES (CLP)

Internal quality control procedures are designed to assure the consistency and continuity of data. If required, external QC procedures (interlaboratory checks) are carried out to assess the accuracy of the data generated. Internal QC procedures are as follows:

- o Instrument performance checks
- o Instrument calibration
- o Documentation on the traceability of instrument standards, samples, and data
- o Documentation on analytical methodology and QC methodology. QC methodology includes spiked samples, duplicate samples, and split sample use of reference blanks and check standards for method accuracy and precision.
- o Documentation on sample preservation and transport

Quality control of the sample data will involve collection of field sample duplicates and blanks and evaluation of the laboratory data. In addition to the procedures for sample collecting and handling described in this plan, it is anticipated that EPA's standard quality control procedures for the Contract Laboratory Program will be used.

Quality Control of field data obtained from measurement equipment will be accomplished by following the guidelines specified in the Sampling and Analysis Plan, and by performing proper calibration procedures at the frequencies specified. In addition, the quality control samples discussed below shall be collected.

Samples collected for analysis by the Contract Laboratory Program will be accompanied by the following quality control samples:

- o One duplicate sample for all analytical parameters being sampled will be collected per matrix per site per day, or one for every 10 samples, whichever is more frequent. The duplicate sample will not be labeled as such.
- o One triplicate sample will be collected for every 20 aqueous samples destined for organics analysis.
- o One volatile organic travel blank will be included for each day of sampling for volatile organic analysis.
- o A complete set of field blanks for the air sampling each day.
- o A complete set of duplicates for the air sampling each day.
- o Quality control of air sampling will be provided by duplication of one entire downwind sampling station.

Rinsate or equipment blanks will not be collected since equipment to be utilized for the sample collection will be disposed of following use. Laboratory performance standards for the CLP will be in compliance with the specifications of the CLP Statement of Work (EPA, 1984b; EPA, 1985).

12.2 QUALITY CONTROL PROCEDURES FOR FIELD MEASUREMENTS

All field measurements and sampling will be performed as specified in the SIPMS, unless otherwise indicated. A performance audit may occur during sampling to verify compliance with sampling SOPs.

12.2.1 WATER LEVEL MEASUREMENTS

Water level measurements will be obtained by utilizing either an electric well sounder or a graduated steel tape. Prior to obtaining measurement data, field personnel should check to see that the instrument has been properly calibrated (see Section 6.0 and 8.0).

At each location and/or time interval, a minimum of two measurements should be taken. The most accurate measurement will be determined by the experienced field technician and recorded in the field notebook or on the appropriate field data form. Data should be recorded to the nearest 0.1 ft.

In addition to replicate measurements, the data should be compared to previous measurements obtained at the well site. If large discrepancies exist from the previous measurements which cannot be explained by local groundwater activities, changes, or trends, the equipment should be re-calibrated and the measurements repeated. If possible, an alternative instrument should be utilized to verify the accuracy of the data.

12.2.2 WATER QUALITY PARAMETERS

Measurements of temperature, pH, and electrical conductance will be performed during each well water sampling event. Prior to obtaining measurement data, field personnel should check to see that the instrument is properly calibrated (see Sections 6.0 and 8.0). For pH and electrical conductance, reference solutions can be prepared and should be utilized to properly calibrate the instrument.

When obtaining data for water quality parameters, measurements should be compared with previous data and examined for large variations. If variations greater than 10% exist and cannot be accounted for by changes in field conditions and/or water quality stabilization, the instrument should be recalibrated and the measurements repeated. The most accurate measurement will be determined by the on-site hydrogeologist and recorded in the field notebooks or on the appropriate field data form. If possible, an alternative measuring device (i.e., another thermometer, pH meter, or electrical conductance meter) should be utilized to verify the data.

12.2.3 AIR QUALITY PARAMETERS

Measurements of organic vapors, methane gas, and explosive atmospheres will be made in the field. Organic vapors will be collected on absorption tubes using personal sampling pumps. Prior to use of either of these instruments by checking calibration and maintenance labels on each. The HNu and OVA instruments must have been calibrated at least one week prior to use. The HNu is calibrated against known isobutylene concentrations and the OVA against known methane concentrations. Also prior to use, the battery level, hydrologic level in the OVA, and instrument response to a wide tip marker pen must be checked. The explosivity meter must have a sticker showing calibration and response factors performed within one week of use.

The flow of the personal sampling pumps must be set in the field prior to use. Flow rate is set using a bubble flow meter or similar device.

12.3 QUALITY CONTROL CHECKS FOR DELIVERABLES

Quality control checks (reviews) of all deliverables will be performed by the REM II team and the EPA. Certain documents will also be reviewed by EPA Region IX, Guam EPA, and the potentially responsible parties' technical review committee. A schedule of deliverables and reviews is included as Figure 2-5.

A preliminary list of deliverable items and reviews is included as Table 2-1.

13.0 PERFORMANCE AND SYSTEM AUDITS

Audits will be performed in accordance with the procedures established in Section 0 of the REM II Quality Assurance Program Plan and summarized in its Audit Flow chart reproduced as Figure 13-1. All audits must be initiated by the REM II Quality Assurance Director (QAD) or his Deputy, or by the CDM Corporate Quality Assurance Manager. The REM II QA Coordinator for Region IX, Robert Harpster, and auditors appointed by the QAD (Robert C. Clinger), or his Deputy (Ulric P. Gibson), will be responsible for implementing the audits.

13.1 SYSTEMS AUDITS

Systems audits have been scheduled during the WP and RI Phases. Systems audits will be carried out to verify that:

- o The necessary procedures of the Work Plan and Remedial Investigation phases are established.
- o The reviews and sign-offs required in Section 3 of the Technical Operations Manual are being implemented.

13.2 PERFORMANCE AUDITS

The QAD, or his Deputy, will determine the need for a performance audit(s), taking into consideration the recommendations of the REM II Regional QA Coordinator and the status of the Ordot Landfill site as an enforcement lead site.

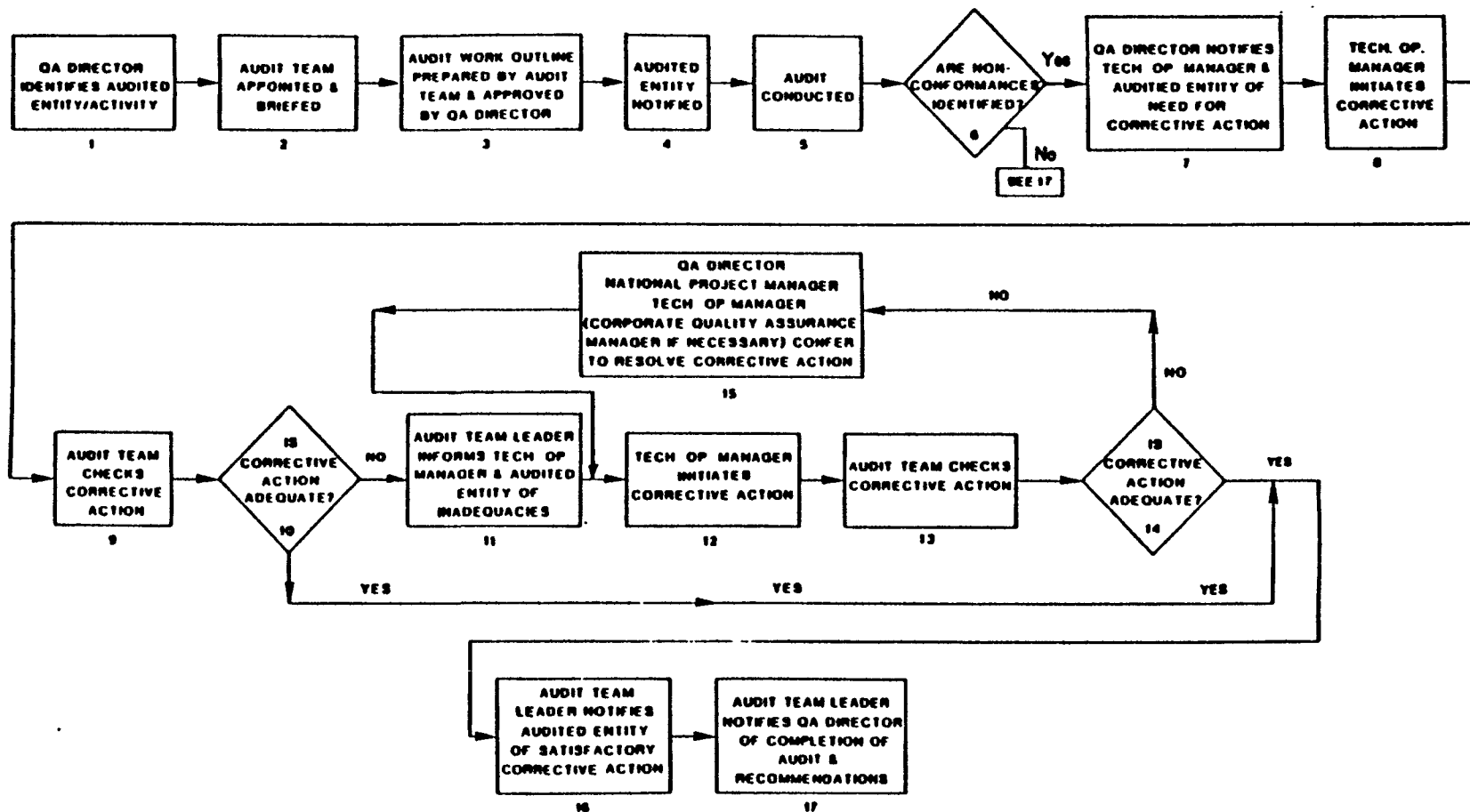


Figure 13-1 Audit Flow Chart

Section: 13.0
 Revision: 1
 Date: 3/13/86
 Page: 2 of 2

14.0 DATA MEASUREMENT ASSESSMENT PROCEDURES

The assessment of data measurements is an activity that affects data quality. In accordance with Section E of the REM II Quality Assurance Program Plan, formally documented procedures must therefore be established for data measurement assessment.

Field data collected during the monitoring efforts will be analyzed through the EPA Contract Laboratory Program (CLP). Table 14-1 provides a summary of the number and types of water samples to be sent through the CLP. Table 14-2 provides a summary of air quality analyses.

The EPA Contract Laboratory Program provides analytical data of consistent and known quality from which to determine the nature and extent of contamination, base assessments of risk, institute remedial actions, or initiate enforcement actions to identify and mitigate threats to public health and environment. Protocols and methodologies are designed by the EPA to provide data of known quality in strict accordance with quality assurance procedures and chain-of-custody and document control requirements. Information on the types of samples which are analyzed may be found in the User's Guide to the EPA Contract Laboratory Program.

In general, the laboratory will adhere to those recommendations as promulgated in 21 CFR Part 58, "Good Laboratory Practices", criteria described in "Methods for Chemical Analysis of Water and Wastes", 1979 (EPA-600/4-79-020), the requirements of the EPA Contract Laboratory Program, and those presented in 40 CFR 136", Guidelines Establishing Test Procedures for Analysis of Pollutants under the Clean Water Act."

14.1 ACCURACY

A sample spike is prepared by adding a known amount of a pure compound to the environmental sample (before extraction for extractables), and the compound is the same or similar (as in isotopically labelled compounds) as that being assayed for in the environmental sample. These spikes simulate the background and interferences found in the actual samples and calculated percent recovery of the spike is taken as a measure of the accuracy of the

TABLE 14-1

SUMMARY OF WATER SAMPLE DATA COLLECTION

Sample Type	Location												Other
	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	SW9	SW10	SW11	SW12	
Surface Water	1	1	0	0	0	0	0	0	0	0	0	0	1 - duplicate
Leachate Stream	0	0	1	1	1	1	1	1	1	1	0	0	1 - duplicate
Leachate Pond	0	0	0	0	0	0	0	0	0	0	0	1	—
Ground Water	0	0	0	0	0	0	0	0	0	0	0	0	1) Well at Washington Jr. High School 2) 1 - duplicate
Spring Water	0	0	0	0	0	0	0	0	0	0	0	0	—
Travel Blanks	Three, one for each day of anticipated sample shipment.												
Total	19												

TABLE 14-2
AIR QUALITY SAMPLING AND ANALYSES

Target Compounds/ Parameters	Sampling Device	Proposed Quantity	Analyses Requested	Analytical Method
<u>VOCs 1st Stage Tenex-GC</u>				
Samples		21	HSL screening for VOCs	GC-MS
Blind Duplicates		3		
Field Blanks		3		
<u>2nd Stage Activated Carbon or Chromasorb</u>				
Samples		21	HSL screening for VOCs	GC-MS
Blind Duplicates		3		
Field Blanks		3		
		--		
Total		54		

Blind duplicates will be collected concurrently with separate equipment at one of the three sampling locations.

total analytical method. When there is no change in volume due to the spike, it is calculated as follows:

$$P = \frac{100 (O-X)}{T}$$

P = Percent Recovery

O = Measured value of analyte

X = Measured value of analyte
concentration in the sample before
the spike is added

T = Value of spike

Tolerance limits for acceptable percent recovery are established in the EPA Contract Laboratory Program.

14.2 PRECISION

Aliquots are made in the laboratory of the same sample and each aliquot is treated exactly the same throughout the analytical method. Spikes are added at approximately 10 times the method detection limit. The percent difference between the values of the duplicates, as calculated below, is taken as a measure of the precision of the analytical method.

$$PD = \frac{2 (D_1 - D_2)}{(D_1 + D_2)} \times 100$$

PD = Percent Difference

D₁ = First Sample Value

D₂ = Second Sample Value (duplicated)

The tolerance limit for percent differences between laboratory duplicates should not exceed 15 percent.

14.3 COMPLETENESS

Completeness will be measured as:

$$C = \frac{V}{T} \times 100\%$$

C = Completeness of analytical effort, in percent

V = Number of sample analyses that have been validated

T = Total number of samples that have been submitted for validation

The targets for completeness for specific parameters are presented in Table 4-1 and range from 85 to 90%.

14.4 COMPARABILITY

Comparability of data is ensured through the use of standard analytical methods or methods with demonstrable equivalency in terms of method performance criteria and equivalent reported units.

15.0 CORRECTIVE ACTION

All nonconformances with the established quality control procedures will be identified and controlled in accordance with Section P of the REM II Quality Assurance Program Plan. No additional work which is dependent on the nonconforming activity will be performed until the nonconformance is corrected.

Corrective actions will be implemented and documented in accordance with Section Q of the REM II Quality Assurance Program Plan. Corrective actions will be defined by the Technical Operations Manager and implemented to the satisfaction of the Quality Assurance Director. A summary of the procedure for correcting nonconformances is depicted in Figure 13-1, Audit Flow Chart.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Quality Assurance Director or his designee will review all aspects of the implementation of this Quality Assurance Project Plan on a monthly basis and submit a summary report to the Chairman of the Board and the Executive Vice President of CDM in accordance with Section B.8 of the REM II Quality Assurance Program Plan. These reviews will include an assessment of data quality, and the results of systems and/or performance audits as appropriate.

In the event of a disagreement between the Quality Assurance Director and the Technical Operations Manager on the adequacy of corrective actions implemented by the latter, the CDM Corporate Quality Assurance Manager may be informed and requested to confer on a resolution of the dispute in accordance with Section O of the Quality Assurance Program Plan (see Figure 13-1).

REFERENCES

- CDM Team. October 1984. REM II Quality Assurance Program Plan. Performance of Remedial Response Activities at Uncontrolled Hazardous Waste Sites. Document No. 999-QC1-RT-ACAB-3.
- CDM Team. December 1984. REM II Site Investigation Procedures (Draft). Performance of Remedial Response Activities at Uncontrolled Hazardous Waste Sites.
- CDM Team. April 1985a. REM II Technical Operations Manual. Performance of Remedial Activities at Uncontrolled Hazardous Waste Sites. Document No. 999-TS1-RT-ASSK-3.
- CDM Team. December 1985. Work Plan. Ordot Landfill Site, Guam. Limited Remedial Investigation. Document No. 279-WP1-WP-CBJT-1.
- CDM Team. December 1986. Draft Sampling and Analysis Plan for Initial Site Characterization Management Plan. Ordot Landfill Site, Guam. Initial Site Characterization. Document No. 279-WP1-PS-CCYE-1.
- USATHAMA. March 1983. Analytical Methods, Descriptions.
- USEPA. March 1979. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-02.
- USEPA. March 1979. Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA-600/4-79-019.
- USEPA. February 1983. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, EPA-600/4-83-004.
- USEPA. 1983. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846.
- USEPA. July 1984a. User's Guide to the Contract Laboratory Program.
- USEPA. July 1984b. Statement of Work, Inorganic Analysis, Contract Laboratory Program. SOW No. 784.
- USEPA. January 1985. Statement of Work for Organics Analysis, USEPA Contract Laboratory Program. IFB WA 85-J176-J178.

APPENDIX A

GLOSSARY OF TERMS

Audit:

A systematic check to determine the quality of operation of some function or activity. Audits may be of two basic types: (1) system audits that consist of a review of the quality control system to ensure that a comprehensive set of quality control methods, procedures, reviews, and sign-off approvals is established or in place, and (2) performance audits in which project activities are observed in process for their compliance with the established quality control procedures and requirements.

Data Validation:

A systematic process for reviewing a body of data against a set of criteria to provide assurance that the data are adequate for their intended use. Data validation consists of data editing, screening, checking, auditing, verification, certification, and review.

Environmentally Related Measurements:

A term used to describe essentially all field and laboratory investigations that generate data involving (1) the measurement of chemical, physical, or biological parameters in the environment; (2) the determination of the presence or absence of criteria or priority pollutants in waste streams; (3) assessment of health and ecological effect studies; (4) conduct of clinical and epidemiological investigations; (5) performance of engineering and process evaluations; (6) study of laboratory simulation of environmental events; and (7) study or measurement on pollutant transport and fate, including diffusion models.

Quality Assurance:

The total integrated program for assuring the reliability of monitoring and measurement data. A system for integrating the quality planning, quality assessment, and quality improvement effort to meet user requirements.

Quality Assurance Program Plan:

An orderly assemblage of management policies, objectives, and principles, and general procedures by which an agency or laboratory outlines how it intends to produce data of known and accepted quality.

Quality Assurance Project Plan:

An orderly assembly of detailed and specific procedures which delineates how data of known and accepted quality are produced for a specific project. (A given agency or laboratory would have only one quality assurance program plan, but would have a quality assurance project plan for each of its projects.

Quality Control:

The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process.

Standard Operating Procedure (SOP):

A written document which details an operation, analysis, or action whose mechanisms are thoroughly prescribed and which is commonly accepted as the method for performing certain routine or repetitive tasks.